Heating Piping & Air Conditioning

FEBRUARY 1955

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

Journal Section of the American Society of Heating and Air-Conditioning Engineers—p. 111

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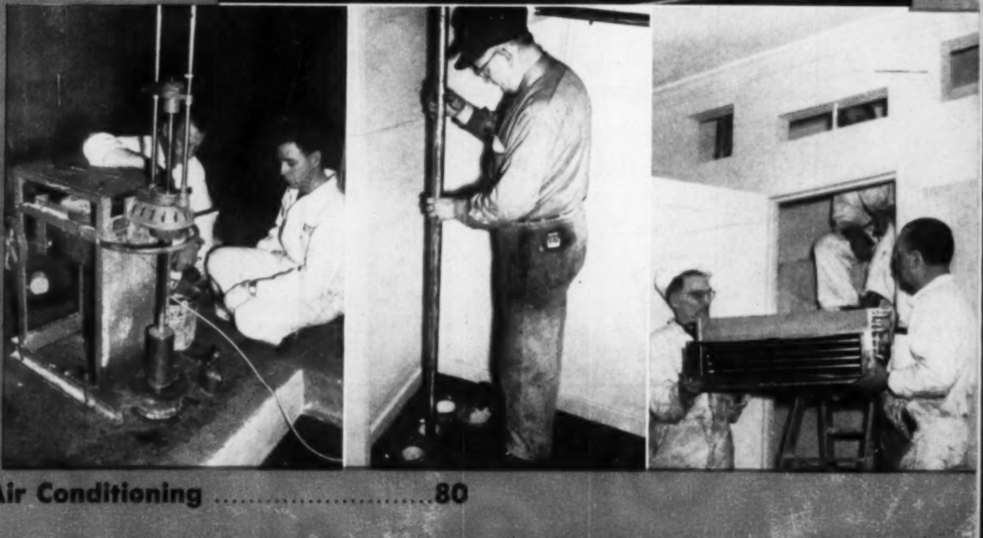
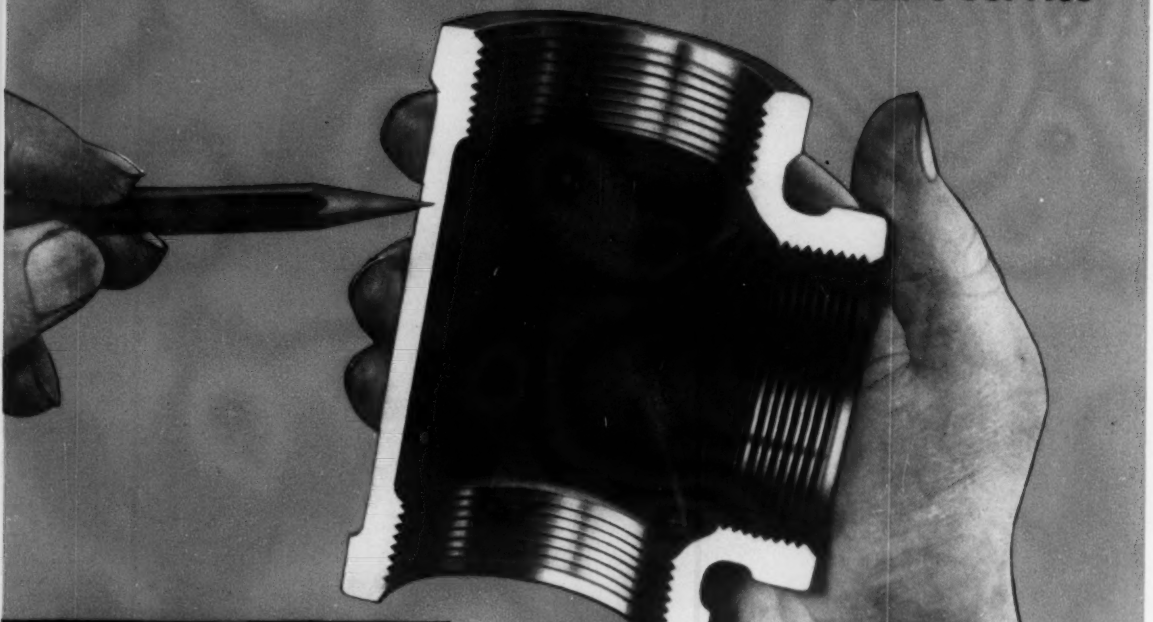


How Drake Hotel Added Air Conditioning 80



UNIFORM WALL THICKNESS

for reliable service

STARTING POINT

high-grade pattern equipment and careful setting of cores

Uniform wall thickness is certainly essential for reliable service. In high-quality pipe fittings it can generally be taken for granted. But it *cannot* be taken for granted unless the quality of the product is backed by continuous care in manufacturing and testing.

At Grinnell, continuous care is built right into the manufacturing process, with modern production methods, efficient inspection procedures, and vigilant attention to every detail.

That is why, when you specify Grinnell, you can be *sure* of—

- High quality metal
- Uniform wall thickness
- Dimensional accuracy
- Clean inside surface for smooth flow
- Proper chamfer for easy starting and protection of first thread
- Precision threads for easy running-up and tight joints

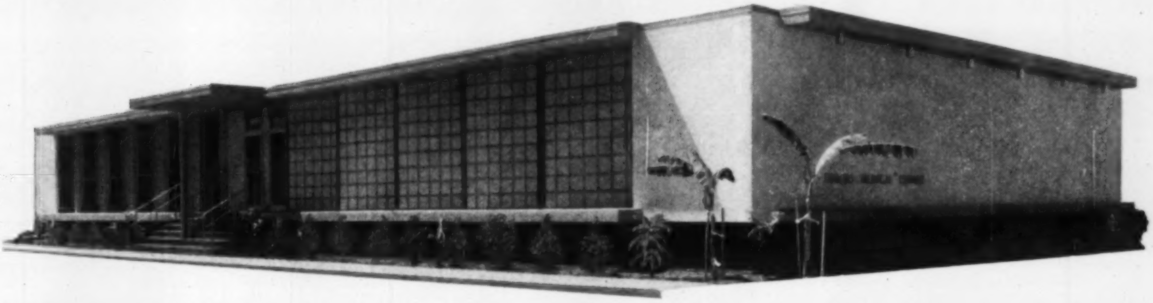
To make fittings the *strongest* link in your piping system, choose from the wide Grinnell line. Available from your local Grinnell Distributor or a Grinnell Warehouse.

GRINNELL
WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

UNUSUAL HANDLING OF SUPPLY AND RETURN AIR SAVES MONEY FOR TEXAS MEDICAL CENTER



usAIRco

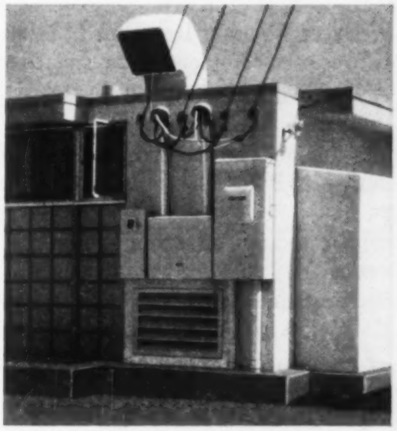
central station RK and duct type gas heaters provide year around conditioning

In addition to eliminating extensive piping runs and lowering labor costs at the new Olmos Medical Center, usAIRco's central station RK requires no roof cooling tower, thus preserving the modern lines of the 48-room San Antonio, Texas structure.

A compact usAIRco RK-25 containing all the elements of a built-up system—air conditioning section, compressor section and water saving evaporative condenser—is located in the indoor equipment room at the rear of the building. Two main supply ducts lead from the equipment room down the center of each double set of offices separated by a center hallway the length of the building. A short take-off from either side of each main duct distributes conditioned air to the individual offices by means of a two-way high wall discharge. The same system furnishes heat in winter, with a usAIRco gas-fired heater in each main supply duct.

Return air grilles are located in each room and in the floor of the hallway, as shown in the top picture at right. A return air plenum extends under the entire floor area of the building. Lower picture of rear of building shows how air is returned to the RK through a chase. The goose-neck exhaust and louvered grille fresh air intake seen in this picture, serve the evaporative condenser.

The Olmos Medical Center was designed by Cerf Ross Associates, architects. The air conditioning system was engineered by Martin E. Staley and installed by the C. H. Dillard Company.



For RK literature write R. N. McLain

UNITED STATES AIR CONDITIONING CORPORATION

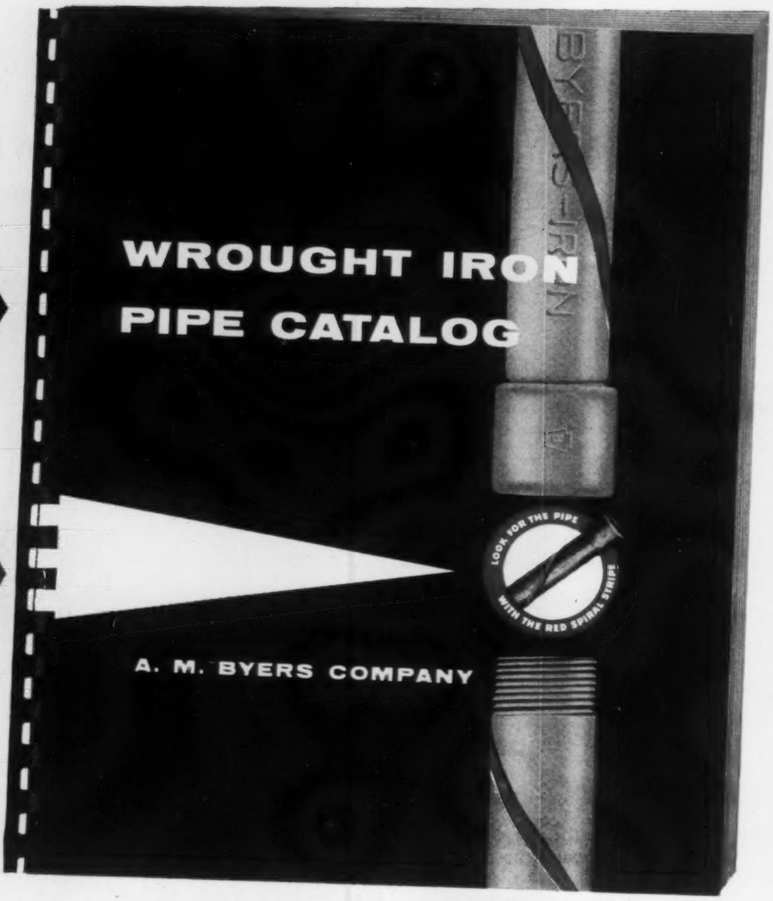
Minneapolis 14, Minnesota • *Export: 13 E. 40th St., N.Y. 16, N. Y., U.S.A.*

usAIRco
30 YEARS OF AIR CONDITIONING

NEW!

WROUGHT IRON PIPE CATALOG

. . . Complete facts and figures



The NEW Byers Wrought Iron Pipe Catalog wraps up between covers complete facts and figures on wrought iron pipe and tubular products.

You'll find:

. . . information on the characteristics of wrought iron and why it resists corrosion and vibration longer

. . . a complete section on wrought iron's physical properties

. . . detailed instructions on how to specify plus a list of wrought iron standards and specifications

. . . proper ordering methods so you get exactly what you want for the job

. . . general notes on mill standards

. . . complete tables on every type of wrought iron pipe, conduit, cold drawn tubing, with detailed data on sizes, dimensions, weights, mill test pressures

. . . helpful tables on decimal equivalents for calculating; dimensions of pipe in fractions of an inch; conversion factors

Important, too, is the organization and arrangement of this material. The catalog's format makes charts and tables easy to find, easy to read and follow. You'll like the way the plastic spiral binding keeps the catalog flat while you use it . . . important with a 52 page catalog.

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WROUGHT IRON

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ELECTRIC FURNACE QUALITY STEEL PRODUCTS

Heating Piping & Air Conditioning Vol. 27 No. 2

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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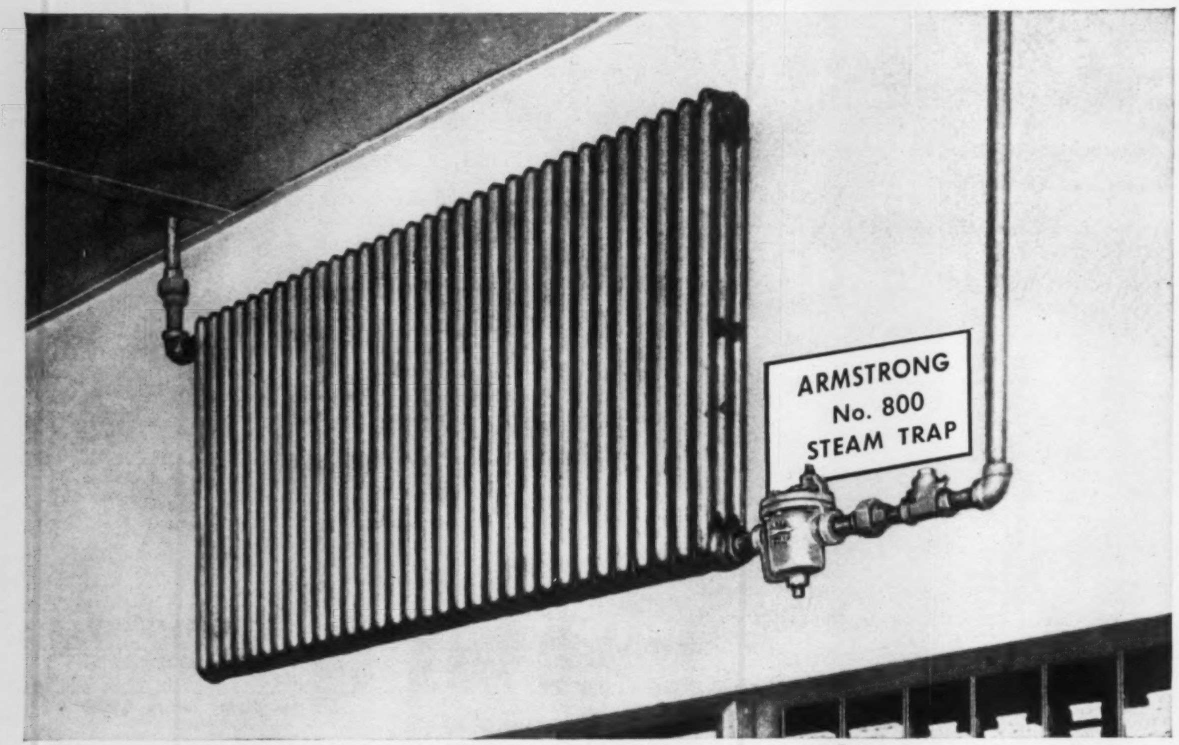
Companions for 11 years at 5 psig, 7" Hg. . . .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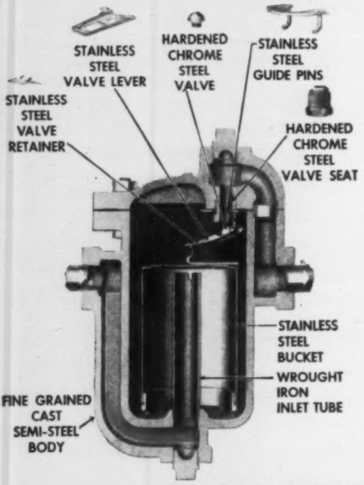
No. 800
STEAM TRAP

Armstrong Trap Maintenance: 2¼¢ per year


STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY

● This low pressure heating system trap has same design, materials and workmanship as traps for 900 lb. pressure, 900° F. jobs.

No wonder it lasts so long!

If you are responsible for a low pressure, vacuum return heating system, installation or operation, new or old, can you confidently expect steam trap repair parts costs anywhere near as low as 2¼¢ per trap per year over an 11 year period? That's the service record of over 100 Armstrong inverted bucket steam traps on a 5 lb. steam pressure, 7" vacuum return heating system at Globe Steel Tubes Company, Milwaukee, Wisconsin. It is not an unusual record for Armstrong traps, either. But, repair parts are the small item.

It pays to take a good, long look at steam trapping from three points of view:

1. Trap Maintenance—how much time and nuisance and cost is, or will be, involved in keeping traps operating properly, especially after they are a few years old. Time and again maintenance of Armstrongs has proved to be a fraction of that of the traps they replaced.

2. Holding Vacuum—biggest source of trouble is leaky steam traps! Have you read the article "Flash at Traps" by T. M. Reynolds. If not send for a free copy. It proves that leaks, not flash, are the problem.

3. Heat—how fast can you heat up a cold system and how much heat can you get out of it? Armstrongs discharge condensate at steam temperature as fast as it reaches the trap. And plenty of air handling capacity is built right into the trap. You get fast heat and maintain maximum temperatures all the time.

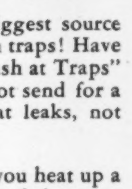
You have nothing to lose by talking it over with your local Armstrong Representative—remember he sells the traps that are *unconditionally guaranteed to satisfy the user* or the purchase price is refunded. Call him today or write Armstrong Machine Works, 874 Maple St., Three Rivers, Michigan.

Application Engineered

ARMSTRONG STEAM TRAPS

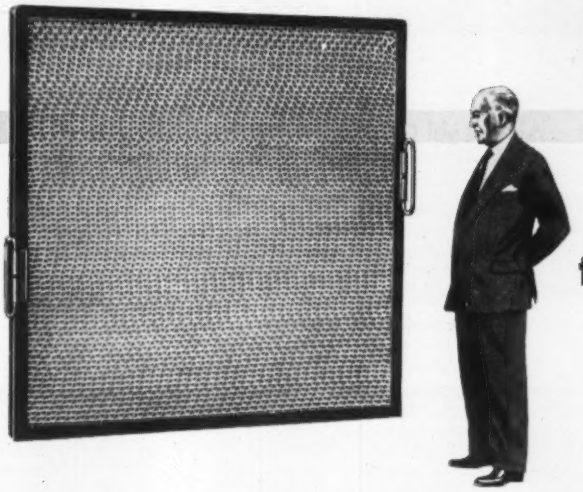
Free "Steam Trap Book"

44 pages of trap data, prices, selection, installation and maintenance information on trapping low, medium and high pressure lines and equipment. Send for it today—no obligation.


ARMSTRONG STEAM TRAP BOOK

Don't forget to ask for the article "Flash at Traps"

You're really looking at 9 air filters!



Because one filter won't do *every* air cleaning job, Farr Company has nine standard types designed to handle practically any dirt condition. Each embodies the famous herringbone-crimp media design and other Far-Air quality features, but differs in materials, thickness, etc. When you select the type you need from the Far-Air line, you are assured of getting the most practical solution for your particular dust problem. Remember, the operating efficiency of the entire air handling system is dependent on the filters used. That is why it is important that the *right type* filters be installed. Farr field engineers will be happy to study your air cleaning problems and make specific recommendations.

Type 68—2"—finer mesh media and tighter pack for higher efficiency on small particles.

Type 44-68—4"—double packed for special applications requiring the highest efficiency.

Type 44—1"—gable crimped for high efficiency; for ventilation, package air conditioners, furnaces, etc.

Type 44—2"—general ventilation for dirt, lint, paint, grease, oil, etc.

Type 44—4"—for greater dirt capacity.

Type MZ—2"—zinc chromate painted before and after assembly; hot dipped galvanized frame; marine ventilation application.

Type MZ—4"—same except 4" thick.

Except as noted, filters are made of zinc electroplated herringbone-crimp steel screen media in sturdy steel frames. Other materials are aluminum, stainless steel and monel. Available in all sizes.

Type C4C4—2"—all copper media and frame; for corrosion resistant water eliminators, etc.

Type C4C4—4"—same except 4" thick.

Send for complete
catalog of FAR-AIR
products to
Farr Company,
P.O. Box 45187,
Airport Station,
Los Angeles 45,
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ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

FARR COMPANY

NO COMPROMISE ON QUALITY

Los Angeles, New York, Chicago, Memphis

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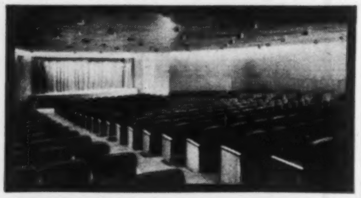
Modernized H. J. Heinz service building demonstrates how to

Give your clients Ideal Indoor Weather when they remodel

Why Honeywell Customized Temperature Control is a "must" in modernized buildings



Controls in the renovated Heinz service building auditorium help provide ideal Indoor Weather—no matter how large or small the gathering for an event.

WHETHER your clients build new or remodel, the object is to provide the best possible facilities and working conditions—of every kind.

Proper year-round temperature and humidity (Indoor Weather) go a long way to create better working conditions.

And the best way to assure this is to *install Honeywell Customized Temperature Control.*

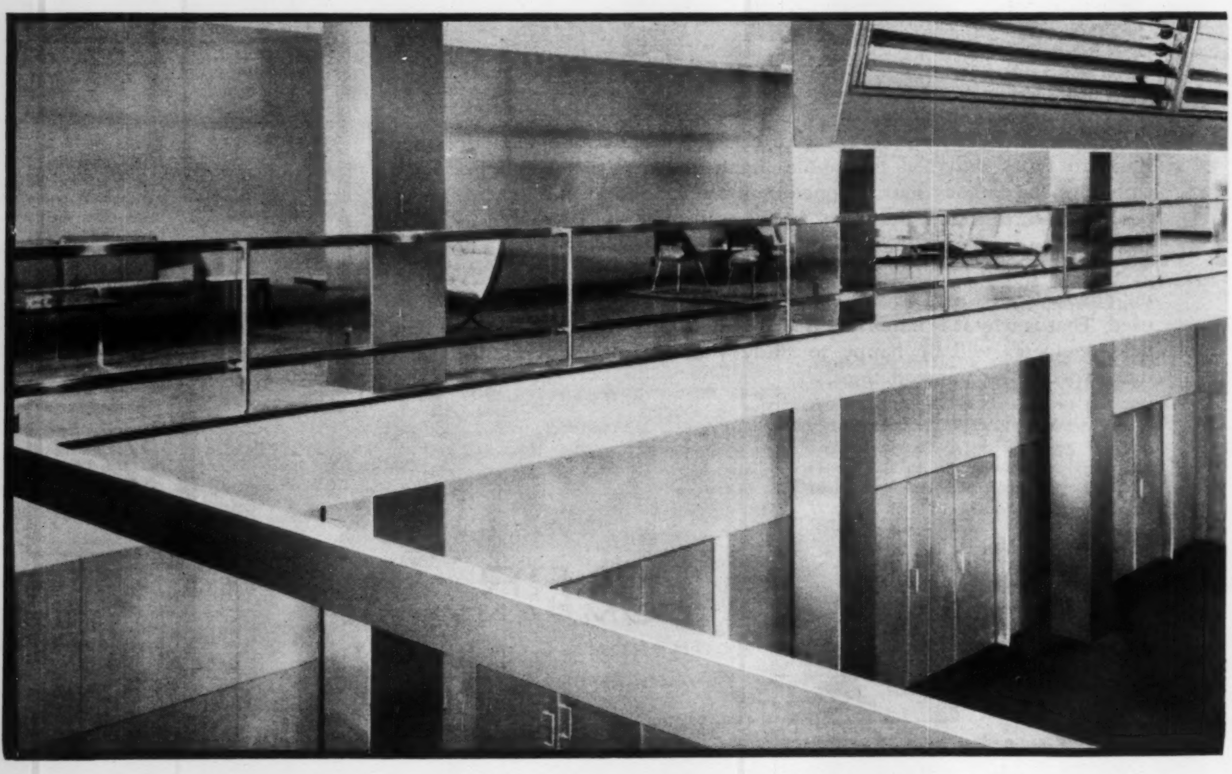
That's the big reason why the remodeled service building of the H. J. Heinz Company in Pittsburgh features it. The service building provides locker rooms where employees change clothes, an auditorium for large gatherings, cafeteria space and many other "service" facilities.

In the control installation, Honeywell thermostats and humidistats control fan systems, heating and cooling coils and humidifiers—compensating for occupancy, exposure and use factors. More on these important factors will be found in the captions.

The *techniques* used in the Heinz service building, applied to your particular problems, can help you provide the Indoor Weather required for your clients' facilities—customized to their needs.

The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants* is your answer. This applies not only to heating and cooling, ventilating and humidity control, but to industrial control as well.

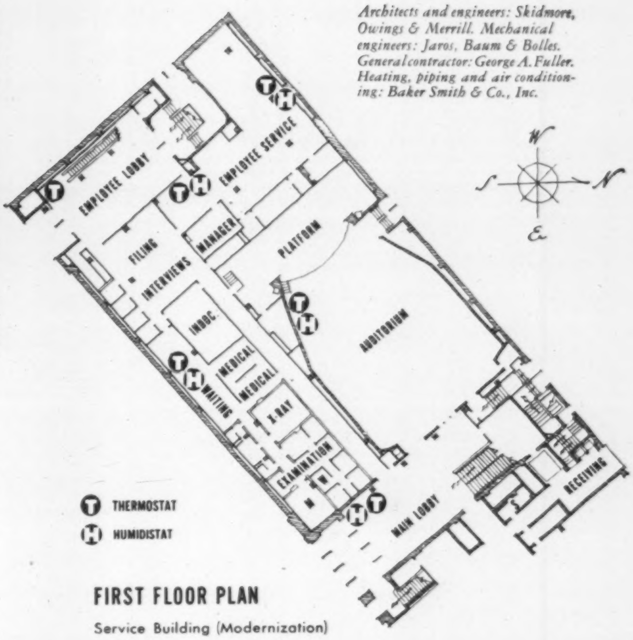
Only Honeywell can provide true "customized" control—for new or modernized buildings. Because only Honeywell manufactures all three types of controls—electronic, pneumatic and electric.



Occupancy. Separate thermostats in the cafeteria provide ideal comfort by calling for more heating or cooling—depending on the number of occupants. They also easily meet special comfort problems such as compensating for heat from steam tables. Separate thermostats, too, provide comfort in locker rooms where the internal cooling load may be raised by the influx of hundreds of people in a few minutes' time.

Exposure. Part of the reason why Honeywell Customized Temperature Control provides ideal comfort is its ability to compensate for exposure factors. Much of the wall space of the large lobby below has a northern exposure. Heat loss is greater here than in other parts of the building. Yet strategically placed thermostats keep not only the lobby but every part of the building comfortable. Buildings in addition to the service building equipped with Honeywell Customized Temperature Control include the vinegar and office buildings.

Architects and engineers: Skidmore, Owings & Merrill. Mechanical engineers: Jaros, Baum & Bolles. General contractor: George A. Fuller. Heating, piping and air conditioning: Baker Smith & Co., Inc.



FIRST FLOOR PLAN

Service Building (Modernization)

For comfortable, even temperature in new or existing buildings—of any size—specify Honeywell Customized Temperature Control

Whether it's an office, motel, hospital, factory—any building of any size—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems. You can give your clients more comfort and efficiency, and they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

MINNEAPOLIS
Honeywell

Customized Temperature Control

112 offices across the nation

Minneapolis-Honeywell Regulator Co.
Dept. HA-2-16, Minneapolis 8, Minnesota

Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

*Name*________________________________

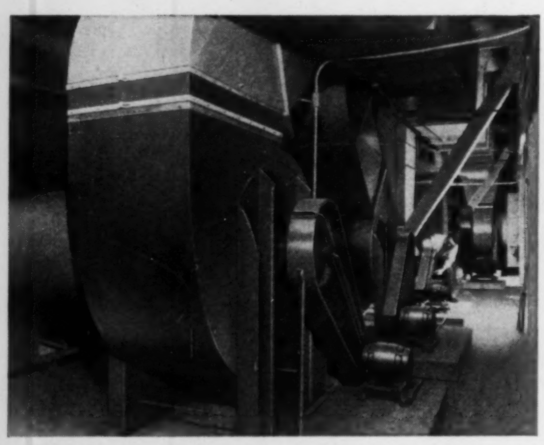
*Firm Name*________________________________

*Address*________________________________

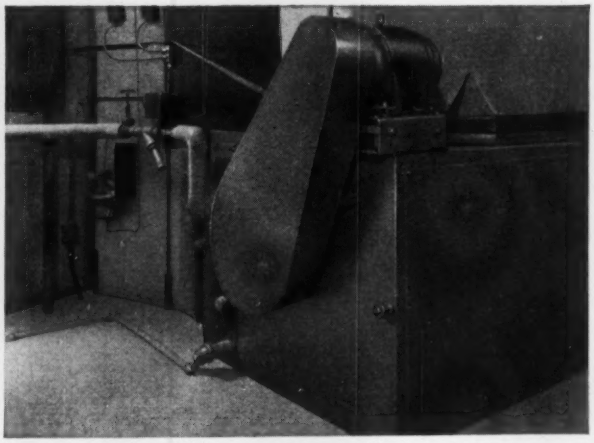
*City*________________ *Zone*____ *State*________

American Blower Supply and Exhaust Fans help to create an ideal indoor climate in modern Terminal Building at San Francisco International Airport. Architect: W. P. Day, San Francisco. Mechanical Contractors: Anderson & Rowe, Inc., San Francisco.

Why San Francisco Air Terminal

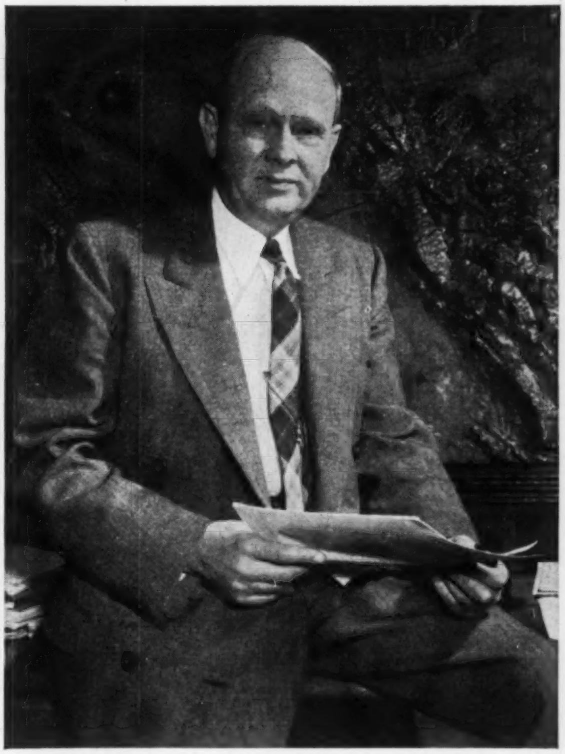


Powerful, quiet-operating American Blower Supply and Exhaust Fans circulate filtered air through Terminal.



Ventilating system also includes American Blower Heating and Ventilating Units (above), Heating and Cooling Coils, Utility Sets.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL



Geo. D. Burr, San Francisco Utilities Commission Design Engineer for airport, tested American Blower Fans; rates them "excellent."

Clyde E. Bentley, consulting engineer says "American Blower Fans are dependable; meet conditions required for top performance."

uses American Blower Fans

New $14 million Air Terminal Building accommodates up to 16,000 passengers a day—in *comfort,* thanks to powerful American Blower air-handling equipment!

SAN FRANCISCO's new International Airport is the nation's third largest, accommodating up to 16,000 passengers a day in its modern six-story Terminal Building, concourse and food-service areas—which include two restaurants, a cocktail lounge and cafeteria.

Refreshing Atmosphere Maintained

Yet, even when traffic is heaviest, the indoor climate in the airport terminal is refreshing and pleasant. For engineers have seen to it that stale air is continually exhausted—and replaced with country-fresh air from outdoors.

Plans called for a ventilation system to service the entire airport—one that would supply an even flow of filtered fresh air, and at the same time give efficient, quiet performance with low upkeep. American Blower equipment was chosen for this important job on the basis of quality and performance.

Fifty powerful American Blower Fans are used in the system, with about 1000 air outlets. Thirty-four fans service the Terminal Building with its main waiting room and offices—a total of 317,000 sq. ft.—and together have a capacity of 265,000 cfm. Seven American Blower Fans are used to ventilate the concourse, which has a floor area of 150,000 sq. ft. Nine others are used to circulate fresh air in the food-service areas.

Call on American Blower

American Blower Fans are used extensively in business and industry for ventilating, air conditioning, drying, heating, fume removal and processing systems. If you'd like the complete story on American Blower air-handling equipment, give your nearest American Blower Office a call, today.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

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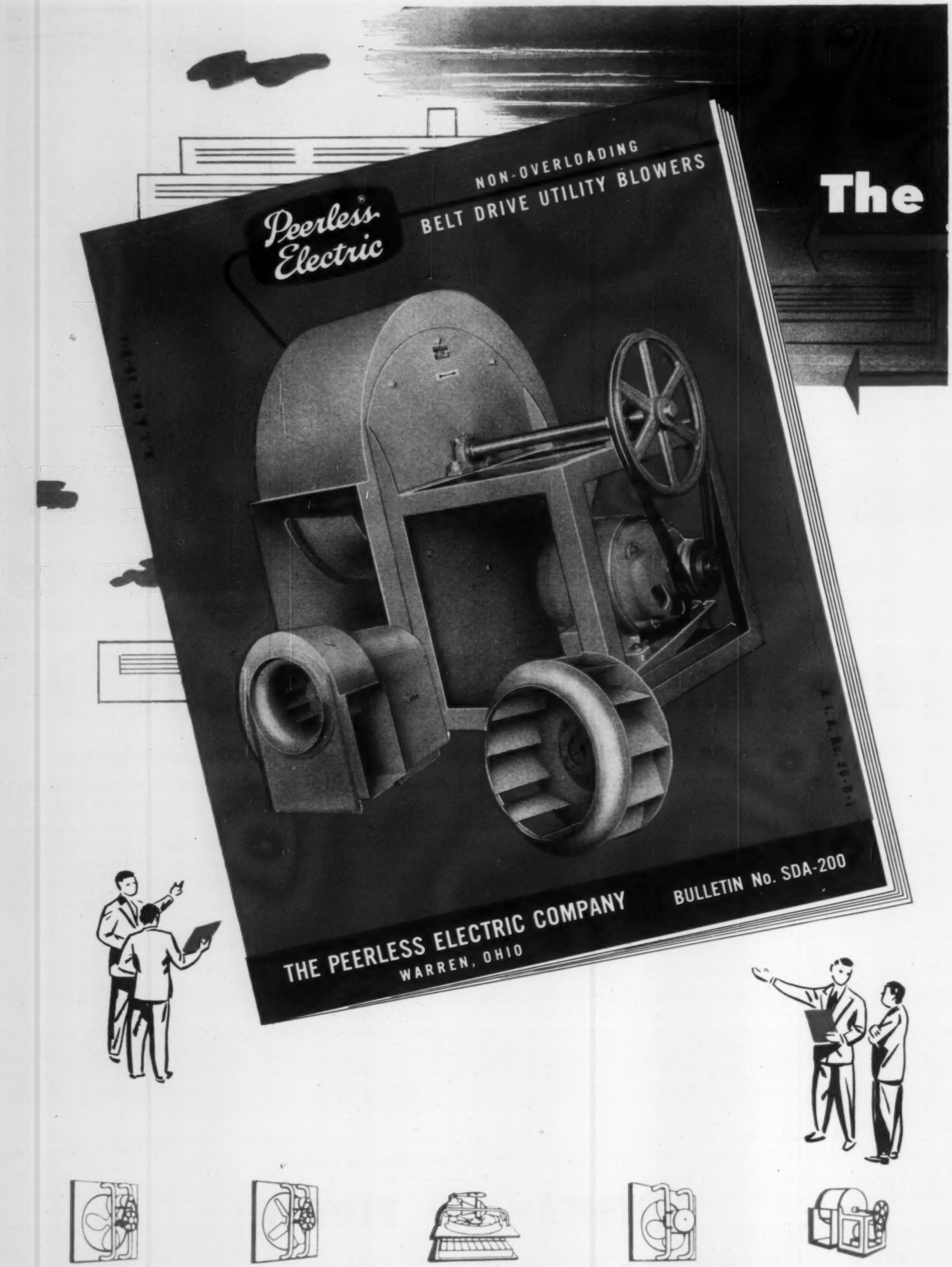
TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS



Peerless Electric

NON-OVERLOADING
BELT DRIVE UTILITY BLOWERS

THE PEERLESS ELECTRIC COMPANY
WARREN, OHIO

BULLETIN No. SDA-200

New Peerless® Electric

BACKWARD CURVE BLOWER CATALOG

GUARANTEED
RATINGS

A COMPLETE, CONCISE,
EASY-TO-UNDERSTAND
GUIDE TO BETTER INSTALLATIONS

This fact-packed 36-page catalog tells you everything you need to know about backward curve blowers in language you can understand. It shows the complete range of sizes from 12½" to 36½"; lists all performance ratings for each size at each motor rating; shows all variable speed ranges; gives you finger-tip reference to CFM ratings, outlet velocities, discharges and rotations. All blower performance ratings are guaranteed by Peerless. These facts, plus the great, new, Peerless Backward Curve Blower, are the keys to better hospital, school, church, factory and government installations. This Peerless blower is the most dependable in use today. Get the facts in Peerless Catalog SDA-200.

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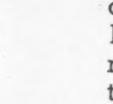
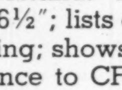
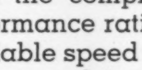
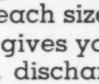








Now! Push-button air conditioning with...
Trane CenTraVac® for runs automatically

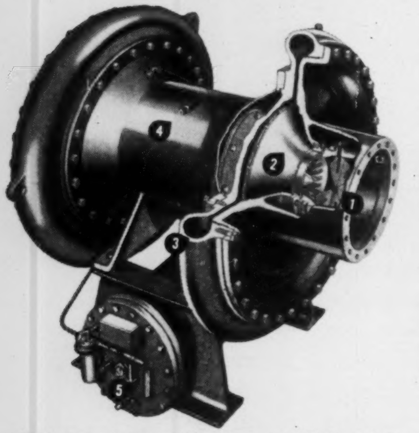
Fully automatic refrigeration unit, up to 400 tons capacity, starts at the touch of a button. Exclusive hermetic design and control system eliminates hours of purging and checking shaft seals before start-up, simplifies cooling system operation.

No shaft seals to cause Freon loss or require constant maintenance! No external drive. All working parts hermetically sealed inside housing. *Cen Tra Vac Freon charge guaranteed for one full year!*

Only one major moving part! Only *two* main bearings! Operates only when full oil pressure is applied to *both* bearings. *For dependability!*

No costly multi-level base required. May be set directly on a level concrete floor of sufficient strength to

Compare these exclusive features



1. Variable inlet vanes.

2. Nonferrous impeller with radial blades.

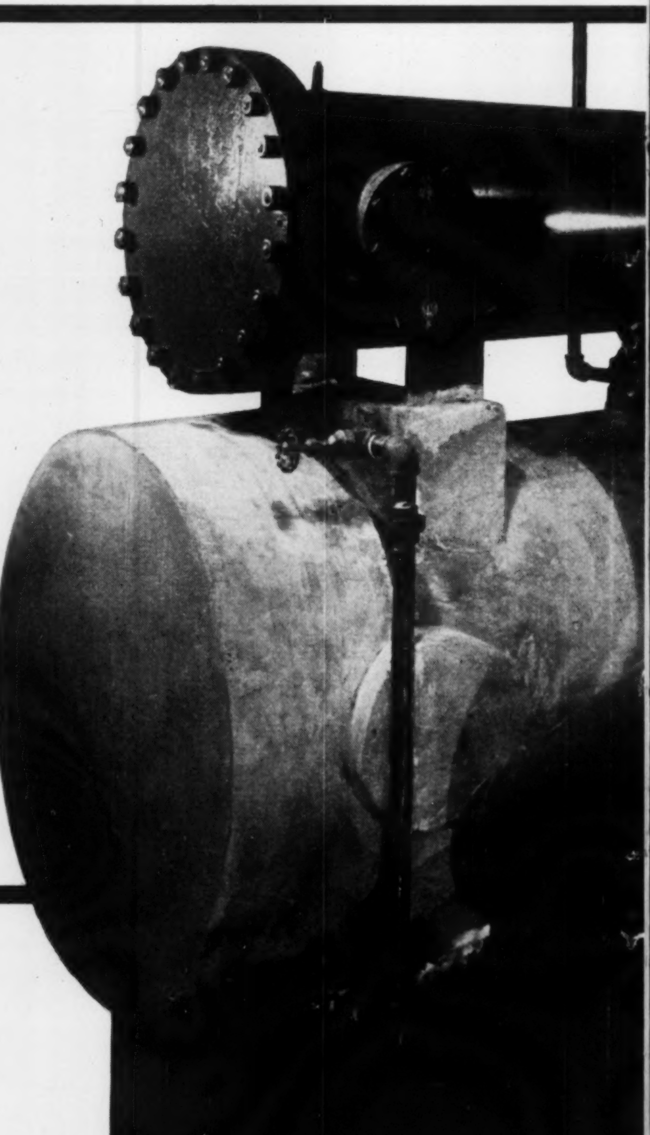
3. Volute housing. Carefully machined gas passages insure smooth gas flow.

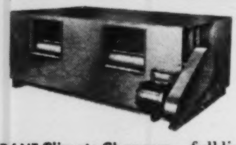
4. Hermetically sealed motor.

5. Forced-feed lubrication system. Pump located below normal oil level — assuring oil supply.

- **Most modern** centrifugal compressor in the industry . . . gives added insurance against obsolescence for years to come.
- **The only hermetic** centrifugal design. All working parts inside. Eliminates gearbox, expensive variable speed motor, shaft seals . . . saves up to 10% power costs.
- **Matches capacity to load** smoothly from 100% to 10% of capacity . . . saves power . . . boosts efficiency.
- **Unrivaled dependability** . . . longer service—only *one* major moving part.
- **Smoother control** . . . exclusive variable inlet vanes give finer modulation.

Here's how CenTraVac cuts operating costs. TRANE CenTraVac modulates from 100% down to 10% of capacity—*with power savings in almost direct proportion!* Now in 8 sizes, 45 to 400 tons capacity.





TRANE Climate Changers—full line of factory-assembled air conditioners. 600 to 29,000 cfm.

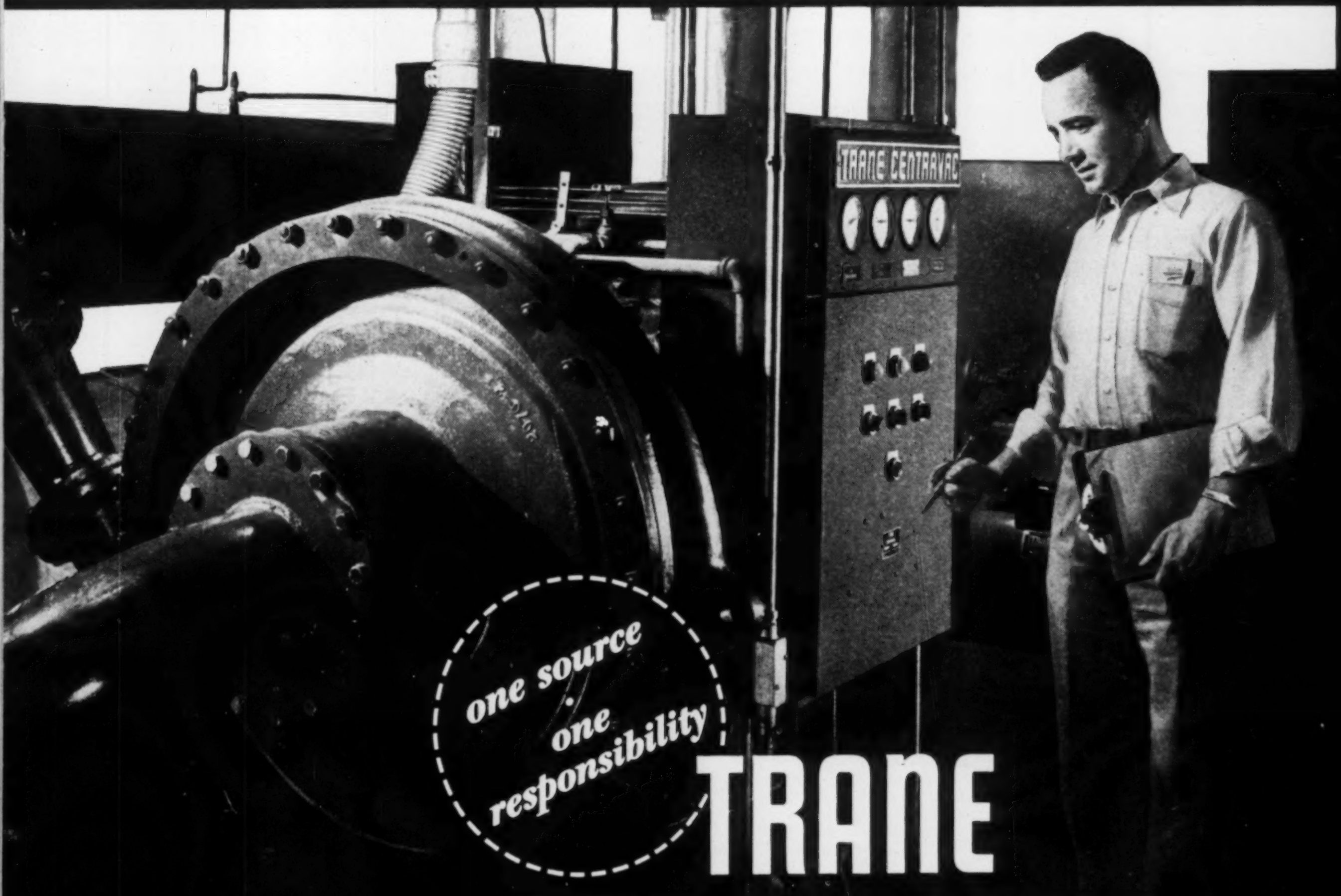
TRANE Cold Generators — packaged water chillers from 10 to 100 tons capacity.

chilling water...starts, stops, ...no special attendant needed

support its weight. No foundation bolts or reinforcing needed. Saves up to $800 on installation costs.

Lower operating costs! CenTraVac automatically adjusts to varying cooling needs from 100% to 10% of capacity—with power savings in *almost direct proportion* to load. Saves up to 8% power compared with 4-step capacity control reciprocating compressor. Hermetic design eliminates power-wasting gearbox and expensive variable speed motor, thus producing outstanding economies in power consumption. Users are assured of substantial savings . . . *plus* years of trouble-free operation!

For complete information on TRANE CenTraVac and the complete TRANE line of air-conditioning equipment, call your nearest TRANE Sales Office or write TRANE, La Crosse, Wis.



TRANE

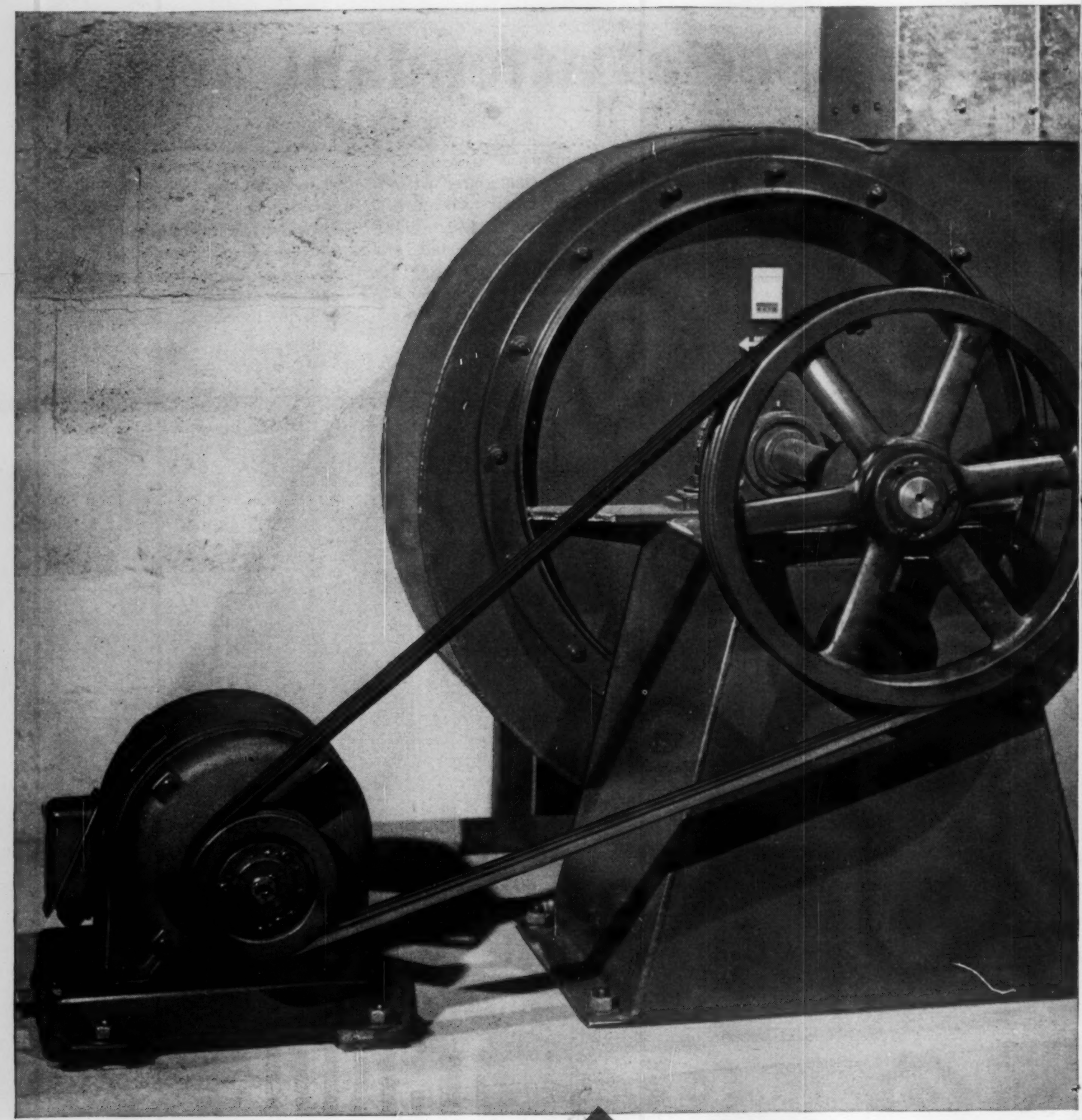
Refrigeration Equipment

for more dependable . . . lower cost air conditioning

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 90 U. S. and 14 Canadian Offices

CUT Engineering and

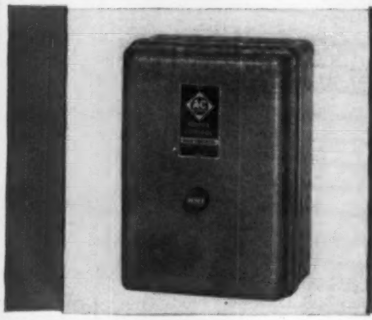


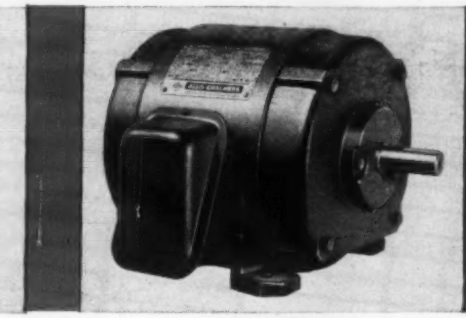
A-C
ALLIS-CHALMERS

ALLIS-

Installation TIME

with A-C Complete Service — from Power Line to Driven Shaft


CONTROL


MOTOR

***Texrope* DRIVE**

ALLIS-CHALMERS CONTROL-MOTOR-DRIVE COMPONENTS are engineered for you . . . to your specific job! All you have to do is call one of the experienced A-C distributors or representatives near you. He'll save you hours of engineering time! You'll save hours of installation time, too. There's no worry about coordinating three sources of supply . . . there's no worry about whether the components will work together.

With the Allis-Chalmers control-motor-drive combination, one reliable supplier guarantees the complete drive. If you need service, the A-C Certified Service Shop near you will take care of it promptly.

Lower your engineering and installation costs . . . get one source guarantee and reliability . . . see your local Allis-Chalmers representative for an A-C control-motor-drive for your next job.

▶ Ample NATION-WIDE STOCKS

A large stock of control-motor-drive equipment commonly used in air conditioning installations is maintained by Allis-Chalmers district offices and Authorized Distributors. In addition, an efficient warehouse inventory system locates seldom-called-for items within hours after you call. You get immediate action when you specify Allis-Chalmers equipment.

▶ Nation-Wide CERTIFIED SERVICE

North, South, East or West . . . there's an A-C Certified Service Shop near you. A-C Certified Service Shops are independent shops which meet strict Allis-Chalmers standards for modern equipment, efficient methods, and business integrity. These shops assure your customers factory-approved parts, equipment, and fast, efficient service.

Send for FREE Engineering Literature

ALLIS-CHALMERS Milwaukee 1, Wisconsin

A-4491

	MOTORS	
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☐	Squirrel-Cage Motors	51B6210
	CONTROL	
☐	Handy Guide to Starters	14B7733
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	***Texrope* DRIVES**	
☐	Handy Guide to *Texrope* Drives	20B6051
☐	*Vari-Pitch* Drive Engineering Data	20B7499

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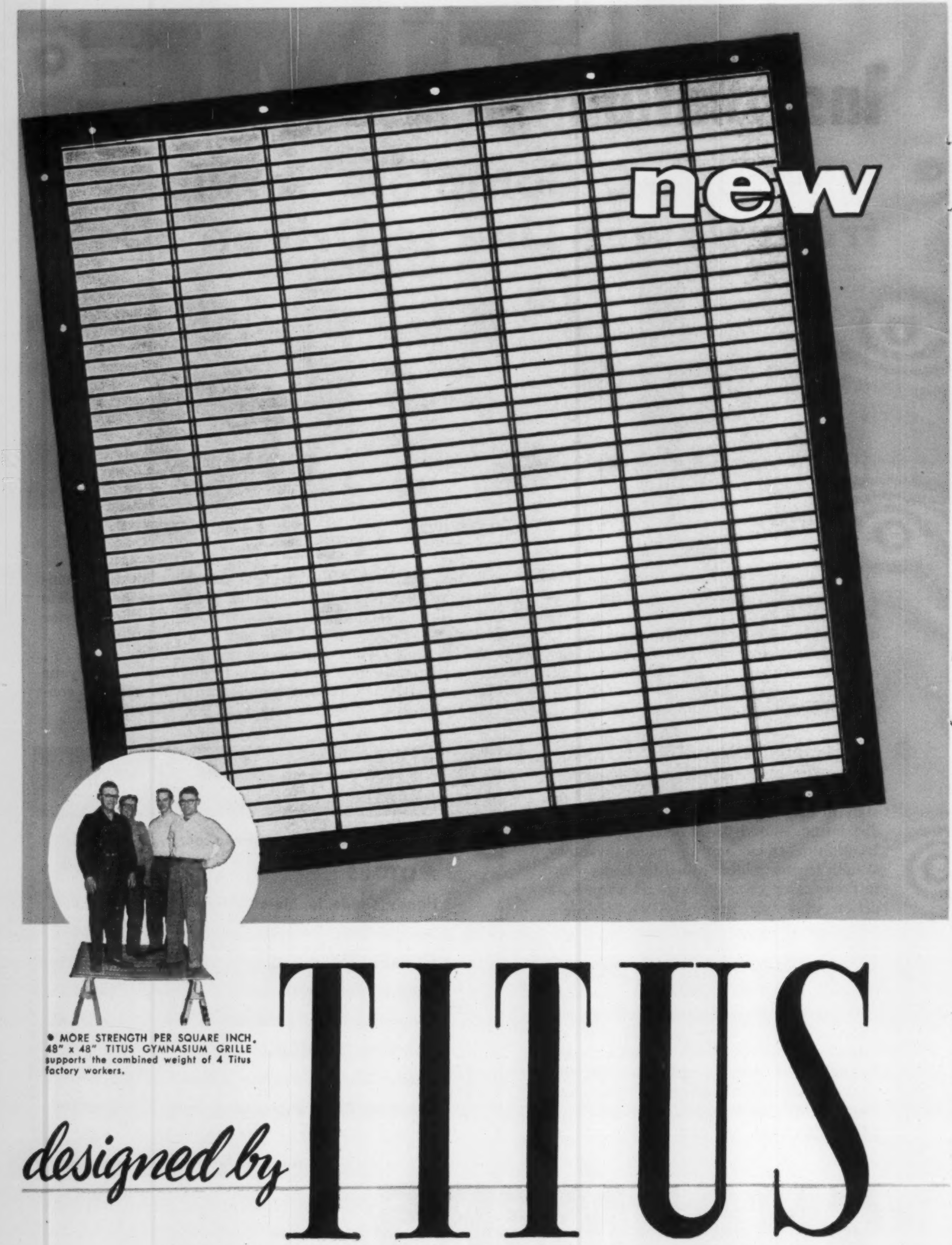
CHALMERS



• MORE STRENGTH PER SQUARE INCH. 48" x 48" TITUS GYMNASIUM GRILLE supports the combined weight of 4 Titus factory workers.

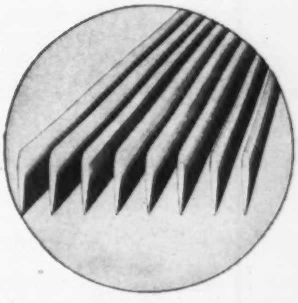
designed by **TITUS**

Gymnasium Grille

Here's a grille that's been especially customed for school and institutional application. It features *special built-in durability* to withstand gymnasium use and abuse. Made to give long efficient service under the most rugged conditions of bouncing basketballs, baseballs, jarring kicks, and bumps. Has smooth contours, no sharp corners or points. Is safety approved for school use. ***Is** simply so rugged it stops damage and replacement costs.*

Clean cut, compact, created to blend with the lines of modern school architecture. Available as grille face only (Model G-1) or grille face with attached volume controller (Model G-2).

The Volume Controller features the famous solid section, extruded aluminum, streamlined Airfoil louvers. Noise and turbulence are cut to a minimum. At the same time, perfect, draft-free air distribution is assured.



• MORE AIR CONTROL PER SQUARE INCH. Close up view of *Airfoil* volume control louvers. Each blade is individually adjustable. Concealed louver support eliminates mullions and butted construction.

● 14 GAUGE ROUND EDGED FLAT WIRE STEEL BLADES ● VERTICAL STEEL SUPPORT BARS PLACED ON 6 INCH CENTERS ● 16 GAUGE STEEL EXTRA WIDE BORDER FOR EASY MOUNTING ● STANDARD GRADE PRIMER COAT FINISH.

TITUS MANUFACTURING CORPORATION • WATERLOO, IOWA

PRECISION BUILT
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QUALITY CONTROLLED

FREE BROCHURE . . . also Special School and Institutions Price Chart. Mail coupon today.

Gentlemen: Please send me complete free information on the new design gymnasium grille.

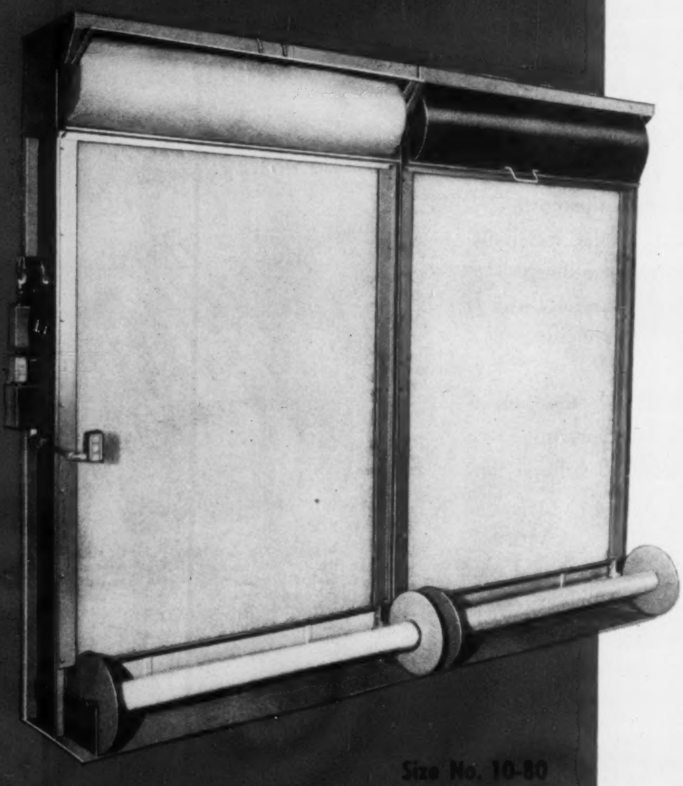
Name ____________________

Company ____________________

Address ____________________

City __________ **Zone** ______ **State** ______

Clean Air by the

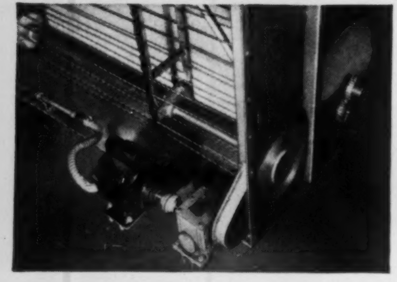


The magic ROLL-O-MATIC!

Front view of automatic self-cleaning air filter consisting of two 5′0″ wide by 8′0″ high sections having a total capacity of 26,700 cfm. The renewable media filtering curtain, mounted in roll form at top of each section, moves down the face of the filter and is re-rolled at bottom.

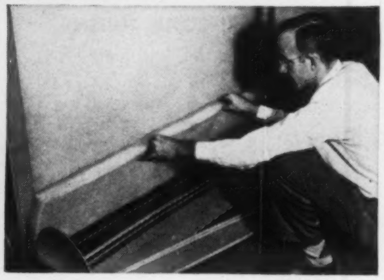
AAF

herman nelson



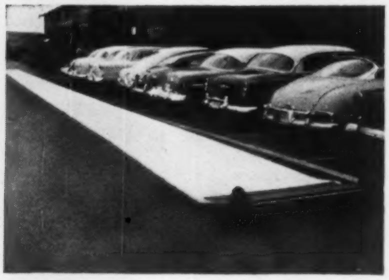
YOUR MAINTENANCE MAN IS A MOTOR!

Controlled by an automatic time switch, this single motor supplies the power for both introducing sufficient clean media to maintain desired operating resistance and for re-winding the dirt laden material.



READY TO ROLL!

Free end of fiber glass filtering curtain is attached to driven spool at bottom of filter which re-rolls the used material for later disposal. Note thickness of material in the filter curtain.

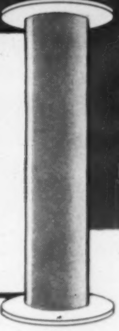


A YEAR'S SUPPLY OF CLEAN AIR!

Pictured is a standard 70 ft. length of filtering material for a 5 ft. wide ROLL-O-MATIC section. When rolled on spool, it forms a compact, easy-to-handle package only 13″ in diameter.

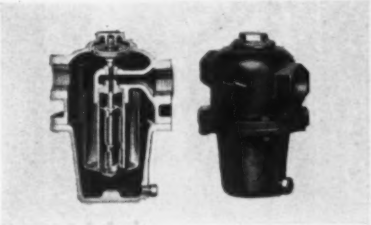
BETTER AIR IS OUR

ROLL!

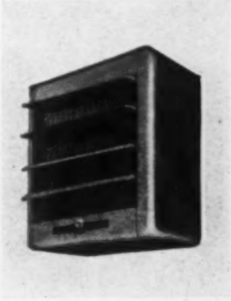


OTHER AAF herman nelson PRODUCTS

AAF Type D ROTO-CLONE—designed for the dry collection of granular dust. One of five basic types in AAF's complete line of dust control equipment. Ask for Bulletin 270.



illinois Float and Thermostatic Traps—made in three series for operating ranges from 50 pounds pressure to 25 inches vacuum. Ask for Bulletin 27.



herman nelson propeller-fan type unit heaters for use with steam, hot water or gas. Ask for Bulletins 700 and 715.

Roll-O-MATIC

writes a new chapter in maintenance-free, low cost air filter operation

Once-a-year air filter maintenance is no longer a "dream". ROLL-O-MATIC makes it a reality with the renewable media filtering curtain supplied in roll form.

This is no ordinary filtering curtain. It's a "blanket" of bonded glass fibers possessing the high cleaning efficiency, dust holding capacity and velocity rating of a viscous filtering media. But, unlike such media, it is sufficiently resilient and flexible to permit packaging 70 ft. lengths in compact 13″ diameter rolls.

Equipped with this versatile media, ROLL-O-MATICS are setting new high standards for maintenance-free operation—a fact verified by field reports which indicate that a single roll of this low cost material represents a *year's supply* per 18,000 cfm capacity under normal operating conditions. This means that, in addition to the man-hours saved through reduced maintenance, ROLL-O-MATICS are operating at less than half the cost of disposable type filters of equal capacity.

"Clean air by the roll" is the most significant air filter development of the past decade. For complete technical data on the ROLL-O-MATIC, call your local AAF representative, now, or write for Bulletin No. 248.

American Air Filter
COMPANY, INC.

373 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

American Air Filter Company, Inc.
373 Central Avenue, Louisville 8, Ky.

I would appreciate receiving catalogs describing the following equipment—

☐ **Roll-O-MATIC** Air Filters (248)
☐ **ROTO-CLONE** Dust Control Units (270)
☐ **illinois** Traps (27)
☐ **herman nelson** Unit Heaters (700-715)

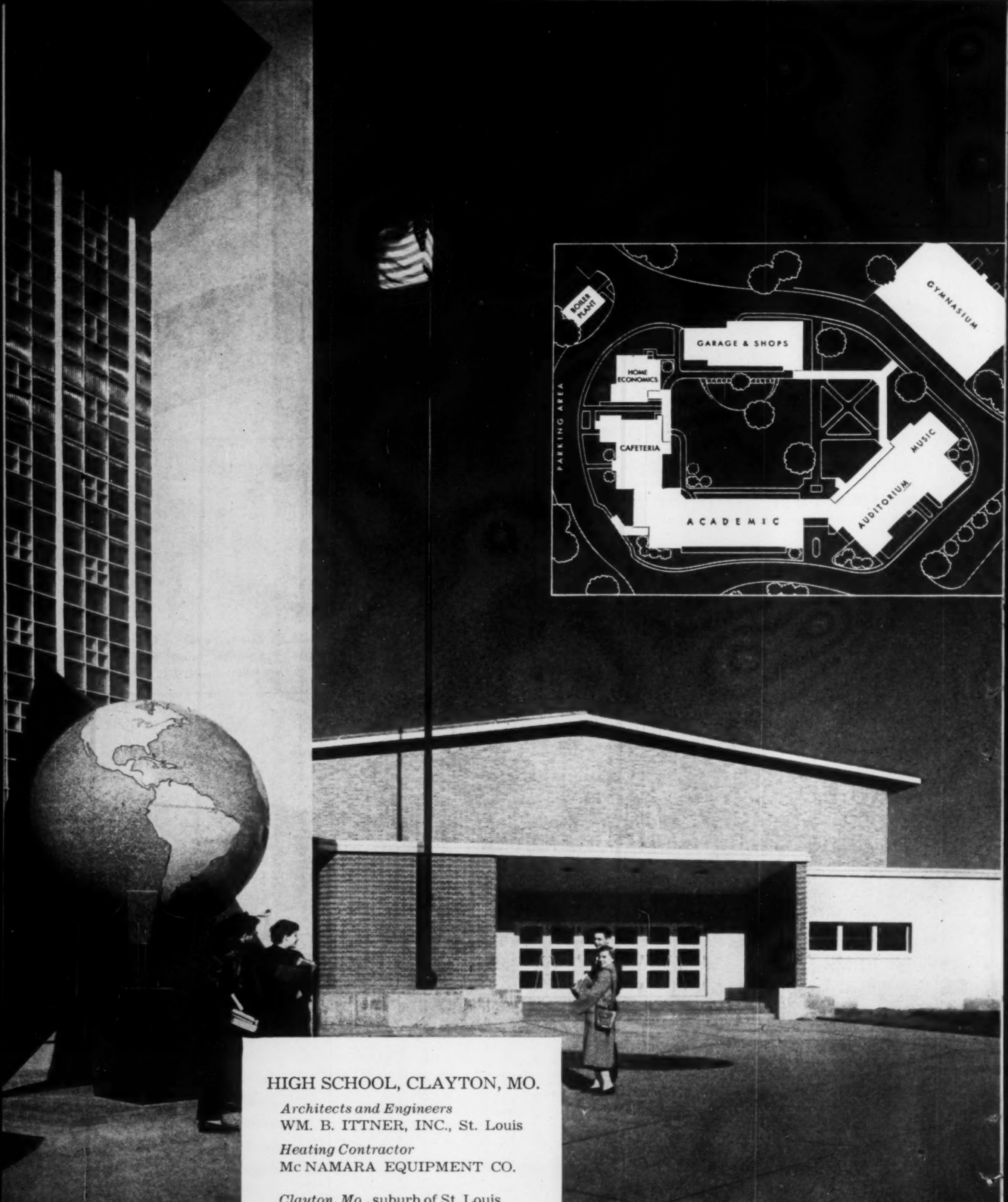
Name________________________________

Company______________________________

Street_______________________________

City____________________State________

BUSINESS


BOILER PLANT
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Clayton, Mo., suburb of St. Louis is justly proud of its new award winning High School which has been cited as "an outstanding example of contemporary, functional school architecture."

ACADEMIC BUILDING left, is 3 stories high

One of the students, teachers and

taxpayers best friends

...it maintains comfortable, healthy temperatures in every room, each with its own independent control . . . prevents OVER-heating and insures utmost fuel economy . . . users report dependable operation after 25 to 50 years of low cost operating and maintenance service –

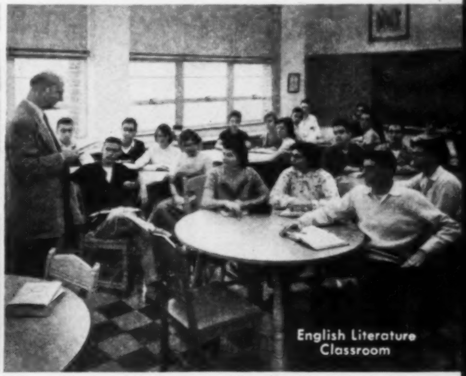
POWERS

Time tested and proven dependable

Temperature Control

INSTALLED IN THE CLAYTON, MO., NEW CAMPUS TYPE HIGH SCHOOL

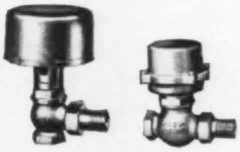
Any of the six buildings here can be occupied at night without operating the entire school plant. Covered walkways connect the buildings which being separated isolate noise from gym, band and shops. Water heaters and shower baths too, are Powers controlled also Whirlpool arm-leg bath in gym.



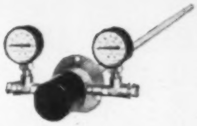
English Literature Classroom

You too can solve your Temperature Control problems with Powers
. . . one dependable source, one responsibility. Consult Powers on all temperature control problems. Our more than 60 years of experience will save time and help you get the right control for your requirements.

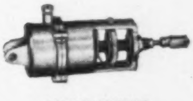
FLOWRITE
Diaphragm Valve



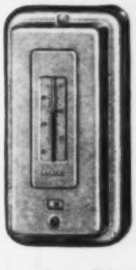
Powers PACKLESS Control Valves — one of the many superior features of a Powers Temperature Control System. Their duo-seal construction reduces valve stem friction, eliminates packing maintenance and leakage of water or steam and gives smooth accurate control.



Above: Powers LIMITEM Low Limit Thermostat. A precision instrument for accurate control of Unit Ventilator discharge temperatures.



POWERSTROKE
Damper Operator



Powers Room Thermostat is truly gradual acting and gives smooth control of valves and dampers.

(c21)

THE POWERS REGULATOR COMPANY

SKOKIE, ILLINOIS | *Offices in chief cities in U.S.A., Canada and Mexico*

Established in 1891 • Over 60 years of Automatic Temperature and Humidity Control

Photos: Mizuki

P.C. *

ORDINARY SODA STRAW
WOLVERINE CAPILATOR *

*** P.C.** - that's PRECISION CONTROL in metering liquids, gases and air—a job for Wolverine Capilator†.

Capilator's *plug drawn* bore is smooth, mirror-bright and held to exceedingly rigid tolerances. Capilator is manufactured to meet the exact "flow characteristics" you specify in sizes from .026" to .080" inside diameters. It is available in copper or aluminum.

Capilator is washed, deburred, chamfered, flow tested and its ends are paper-wrapped. Don't draw straws—specify Capilator—and be sure. Write for the Wolverine Capilator Report. WOLVERINE TUBE, 1461 Central Avenue, Detroit 9, Michigan.

EST. 1916

WOLVERINE TUBE
DIVISION OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing
and Extruded Aluminum Shapes

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA.
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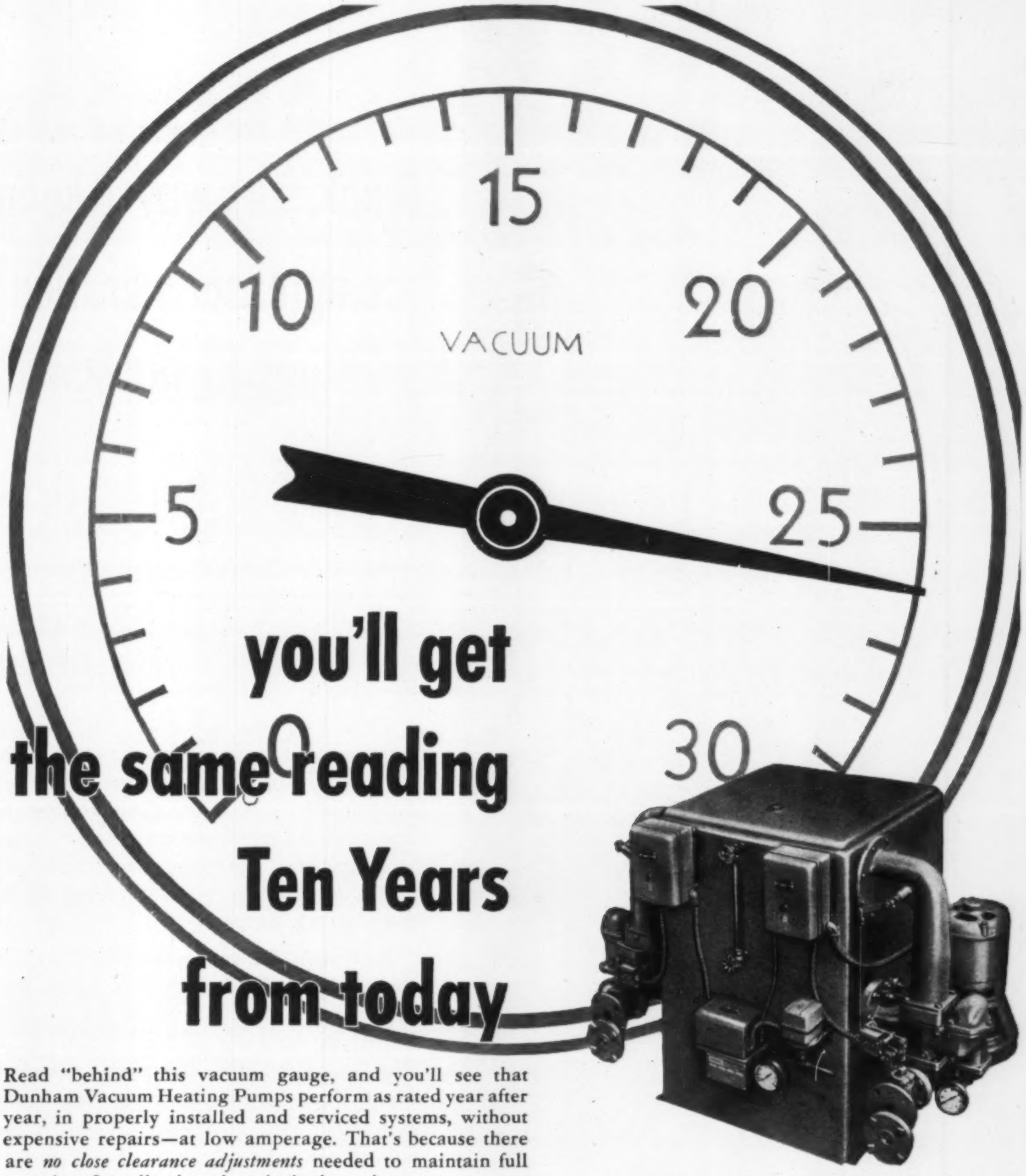

you'll get the same reading Ten Years from today

Read "behind" this vacuum gauge, and you'll see that Dunham Vacuum Heating Pumps perform as rated year after year, in properly installed and serviced systems, without expensive repairs—at low amperage. That's because there are *no close clearance adjustments* needed to maintain full capacity. Impeller is only principal moving part.

Dunham gives you a pump "package" too. No "extras" to buy! All standard units have controls mounted and wired. Duplex Pumps have mechanical alternator.

Low level inlet connections simplify installation. No vacuum on stuffing boxes. All important parts readily accessible. For full information, mail coupon.

DUNHAM VACUUM PUMPS

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES

QUALITY FIRST FOR FIFTY-ONE YEARS

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

DUNHAM VACUUM HEATING PUMP

Single and Duplex models for capacities from 2,500 through 65,000 EDR

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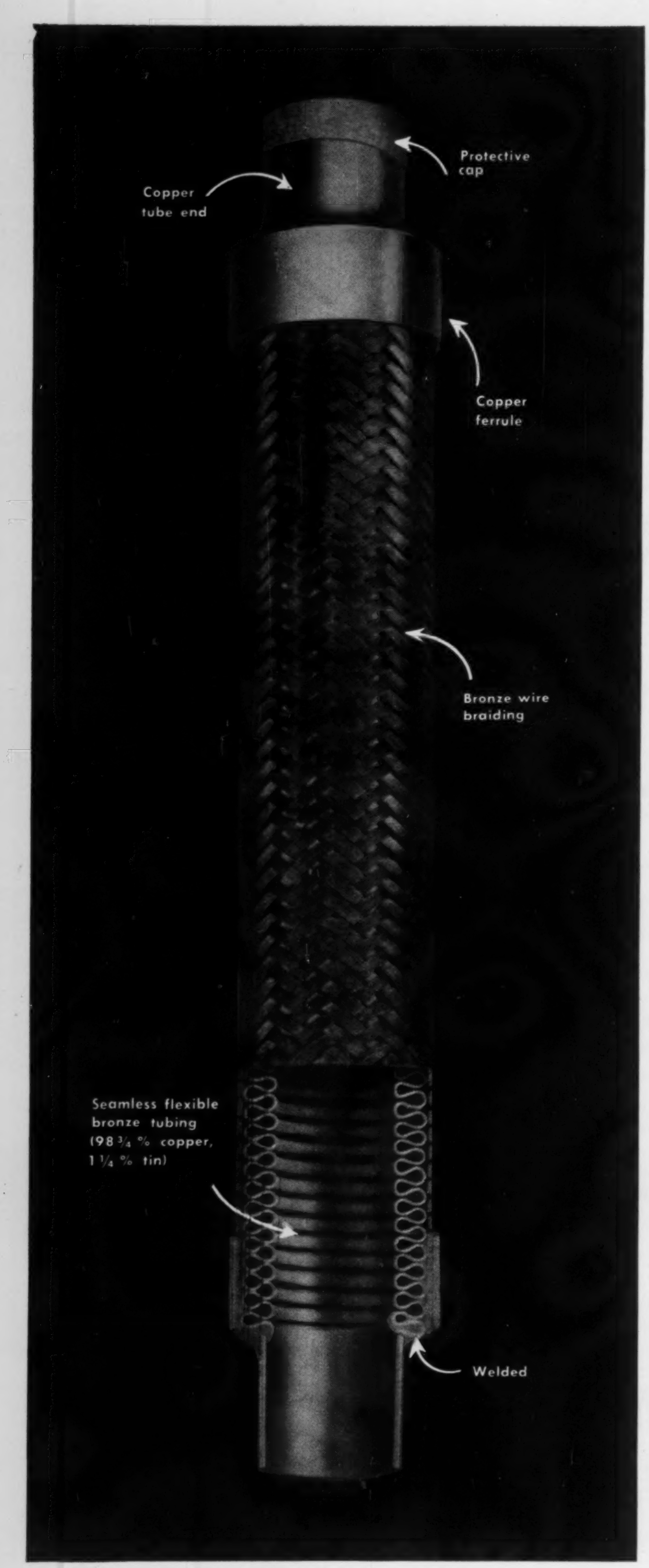
Chicago 6, Illinois
Please send your new Pump Bulletin just off press.

Name__________________________________

Firm__________________________________

Address________________________________

City__________________Zone____State______



Quick, sure way to keep compressor vibration under control

Unchecked vibration in pipe lines of refrigeration and air conditioning units may result in objectionable noise — tubing failure — refrigerant loss. Result: maintenance costs climb, customers complain.

Here's an easy, inexpensive solution: simply install an American Vibration Eliminator.

These flexible seamless bronze tubes allow for expansion and contraction in the rigid lines. They absorb and dampen vibration. They muffle noise. They guard refrigerant lines against fatigue-cracking. And they are as leakproof as the piping itself . . . convey costly refrigerants safely. Upkeep is reduced to a minimum.

American Vibration Eliminators are stocked by leading wholesalers. They come in standard copper tube sizes. For more information, write for Bulletin VE-310R to: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.* 54226

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

an ANACONDA® product

AMERICAN VIBRATION ELIMINATORS are built to last. Wire braid cover gives added strength and durability. Ends are sealed with protective cap to prevent contamination prior to installation.

LOOKING FOR QUALITY BRONZE GLOBE VALVES?

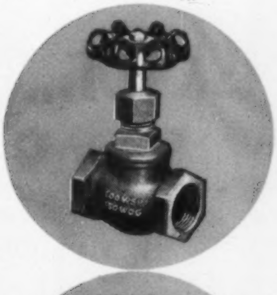
Be sure to check the O-B Lineup

You can find just the globe valve you need in this lineup of 100 and 125-pound (WSP) valves. Note that at the 100-pound level you have a choice of a brass disc valve (No. 201) or a renewable disc valve (No. 301).

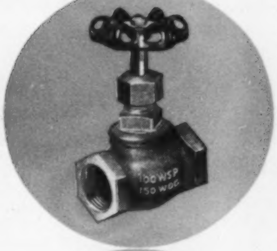
Other O-B Globe Valves, including those with higher pressure ratings, are described in Bulletin 1322-V which is available on request. Your O-B distributor can give you complete information on all O-B valves...globes, gates, checks and valves designed especially for air conditioning installations. Why not call him today?

Ohio Brass
MANSFIELD OB OHIO, U.S.A.

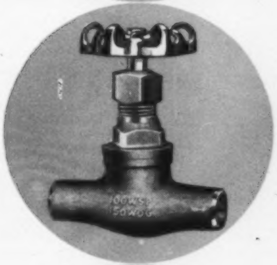
4569-V



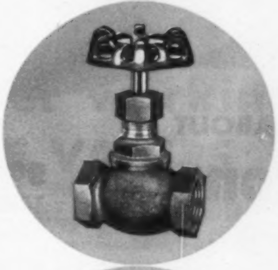
No. 201 GLOBE
100 Lbs. W.S.P.
150 Lbs. W.O.G.
Brass Disc
Sizes—1/8 through
3 inches



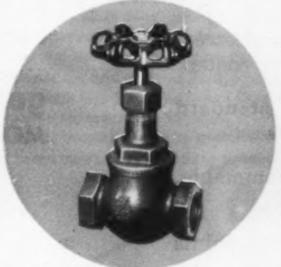
No. 301 GLOBE
100 Lbs. W.S.P.
150 Lbs. W.O.G.
Composition Disc
Sizes—1/4 through
2 inches
Available with drain—3/8
through 1 inch
(Fig. No. 308)



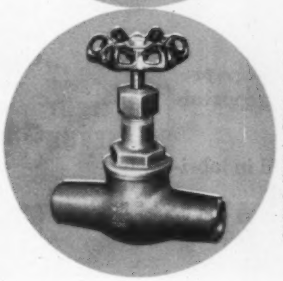
No. 601 GLOBE
100 Lbs. W.S.P.
150 Lbs. W.O.G.
Solder Type
Composition Disc
Sizes—3/8 through 1 inch
Same sizes available
with drain
(Fig. No. 608)



No. 101 GLOBE
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Brass Disc Sizes—1/8
through 3 inches



No. 1501 GLOBE
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Available with hard
steam disc, or soft disc
for use on water, oil
or gas.
Sizes—1/4 through
2 inches



No. 1601 GLOBE
125 Lbs. W.S.P.
200 Lbs. W.O.G.
Solder Type
Available with hard
steam disc, or soft disc
for use on water, oil
or gas.
Sizes—1/4 through
2 inches

Always Ask for... genetron®

Super-Dry Refrigerants

QUICK FACTS ABOUT

genetron

REFRIGERANTS:

- Super-Dry: guaranteed exceptionally low moisture content
- Non-corrosive to standard equipment materials
- Non-toxic, non-flammable, stable, safe
- Critical and freezing points are well outside range of operating uses
- Solvent action on oil helps prevent solidification or congealing of lubricant
- Miscible with oil; aid in lubrication of equipment

genetron 11—ORANGE LABEL
TRICHLOROMONOFLUOROMETHANE

genetron 12—WHITE LABEL
DICHLORODIFLUOROMETHANE

genetron 141—GREEN LABEL
MONOCHLORODIFLUOROMETHANE

For further information on "Genetron" *Super-Dry Refrigerants*—see your wholesaler, or write or phone any General Chemical office listed below.

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ALLIED CHEMICAL & DYE CORPORATION
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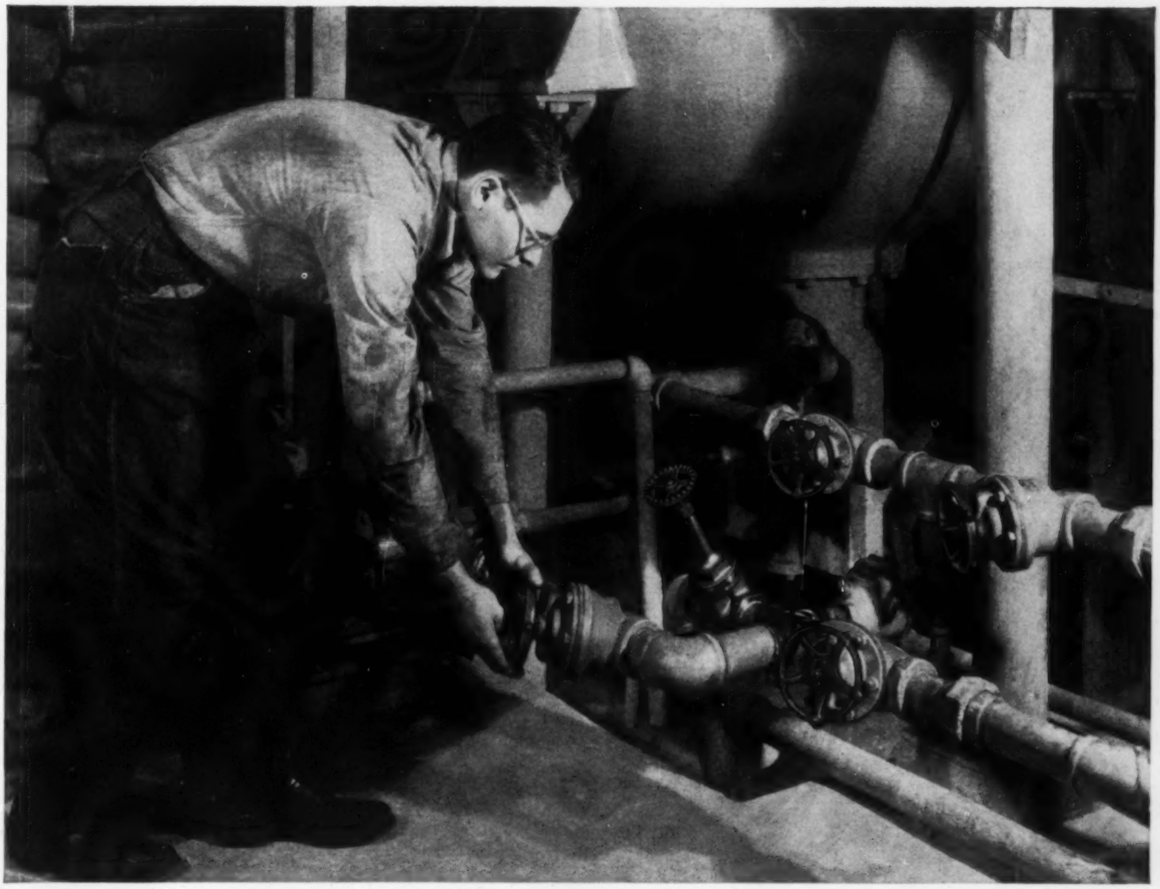

Heavy fluids can't hinder working parts in these CRANE VALVES

THIS CASE HISTORY tells how the United States Playing Card Co., Cincinnati, solved—with Crane Diaphragm Valves—a costly problem of piping heavy enamels for paper coating.

The trouble was in the plug cocks and conventional gate valves formerly used in the enamel lines. During normal shutdowns the heavy liquid would build up on seating surfaces, in stem threads and working parts. The cocks and gates would "freeze up" . . . were hard to operate . . . couldn't be shut tight. The condition hampered production . . . made floors messy and dangerous . . . pushed maintenance costs sky-high.

Replacing with Crane Packless Diaphragm Valves stopped the trouble completely. Their sealed-to-fluid bonnet and pliable neoprene disc insert did the trick. After more than 4 years, all 48 Crane valves installed—with no maintenance whatsoever—are still seating tight . . . still operating freely and smoothly.

CRANE PACKLESS DIAPHRAGM VALVES

Working parts are safely out of contact with line fluid. The diaphragm seals the bonnet—that's all it does, giving it longer life. The independent disc with pliable insert seats tightly on foreign particles or seat deposits . . . and controls fluid, even should diaphragm fail. See your Crane Catalog or Crane Representative for wide selection of body, bonnet, and trim materials in these valves for countless uses.

CRANE
150 WOG

for the THRIFTY BUYER

CRANE CO.

General Offices: 836 S. Michigan Ave., Chicago 5, Illinois
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VALVES • FITTINGS • PIPE • KITCHENS • PLUMBING • HEATING

CRANE'S FIRST CENTURY . . . 1855-1955

FEWER JOINTS!

CHASE® Copper Water Tube for Radiant Heating—*saves you time!*

Because Chase Copper Water Tube comes in long lengths of 60 and 100 feet, fewer joints are needed—a time-saving feature that *also* means a neat, *pressure-tight* radiant heating installation.

And Chase Copper Water Tube is easy to install. It's light in weight, can be easily bent *by hand,* and can be joined quickly with leakproof Chase Copper Solder-Joint Fittings . . . using standard soldering techniques.

Furthermore, Chase Copper Water Tube can't clog with rust. Once installed, it's there to *stay*—protecting your reputation with *years* of leakproof service.

Your Chase Wholesaler stocks Chase Copper Water Tube and Solder-Joint Fittings in all sizes. Call him today.

Chase Products mean
a quality job at little
or no extra cost!

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

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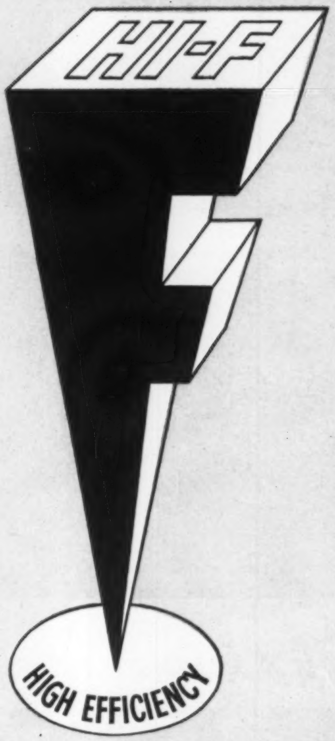
Announcing . . . Hi-F (High Efficiency)

FINNED COILS FOR REFRIGERATION AND AIR CONDITIONING



Hi-F, a new name in copper and aluminum finned coils, is going to influence your sales and profits in 1955.

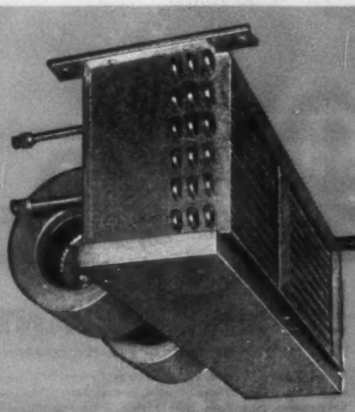
Hi-F finned coils, used either for evaporators or condensers, are made by automatic machinery in entire sections. An exclusive patent-applied-for Peerless process brings you all the advantages inherent in mass production, plus an unsurpassed efficiency, due to the superior bond between coil and fin.

In our new modern plant, production schedules for any manufacturer or contractor can be made on a delivery-on-time basis.

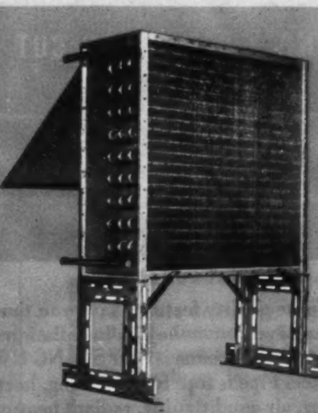
Illustrated are a few of the more popular types of Hi-F coils for air conditioning described in our new bulletin which is yours for the asking.

MANUFACTURERS, NOTE—***Send us blue prints of your evaporator and condenser requirements for a Hi-F quotation. Please indicate delivery requirements.***

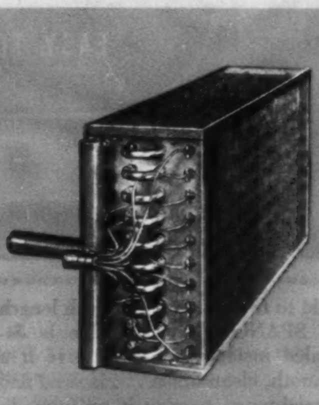
PEERLESS OF AMERICA, INC.
5830 N. PULASKI ROAD, CHICAGO 30, ILLINOIS, U.S.A.



- **Hi-F Direct Expansion Evaporator with Blowers. Ceiling mounts permit installations in attics, closets, vestibules, or out of the way places. For homes and motels, etc. Capacity ¾, 1, 1½ and 2 tons. Available also with condensate pump and for cold water.**



- **Hi-F Air Cooled Condenser for mounting in stand on roof or remote outside location—also indoor installations with discharge duct to outside. Low Cost. ELIMINATES USE OF WATER. ¾, 1, 1½, 2, 3, 5, 7½ and 10 ton capacities.**



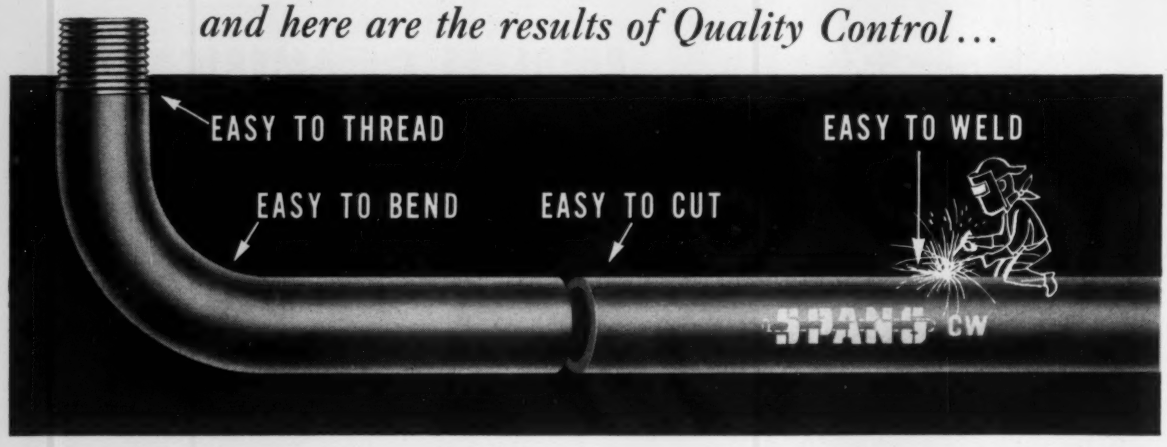
- **Hi-F Direct Expansion, Multi-Circuit, 4 row Air Conditioning Evaporators available in 2, 3, 5, 7½, 10 and 15 ton capacities. Copper tubes with aluminum fins. Also available for cold water.**

Here's SPANG® *Quality Control at work... for you!*

These dials, gages and recorded graphs are the story behind SPANG *quality* control. Located beside the heating furnace, they automatically control the furnace heat zones at pre-determined temperatures as *top-quality* skelp is heated prior to the forming and welding of SPANG CW Steel Pipe.

It's the right combination of controlled gas and pre-heated air entering the various sections of the furnace that produces *top-quality* SPANG Pipe with strong, clean, uniform welds.

and here are the results of Quality Control...



Add to this the fact that each length of SPANG CW Steel Pipe is descaled inside and out to give it a smooth, clean finish . . . is sized and straightened to give it uniform diameter . . . is tested and inspected completely to assure a *top-quality* product . . . and you have the complete SPANG *quality control* story.

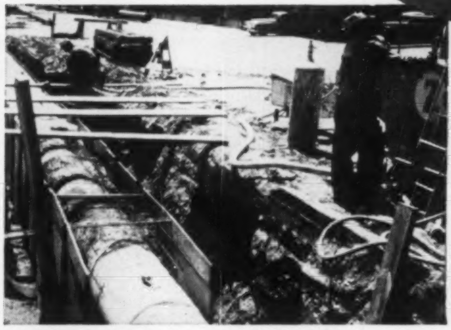
These quality features save you time . . . save you money on installations.

All this means is that SPANG CW Steel Pipe is tops for plumbing, heating, air conditioning, radiant heating and snow-melting installations. Your nearby SPANG Distributor carries a complete stock of SPANG Pipe. Let him serve you!

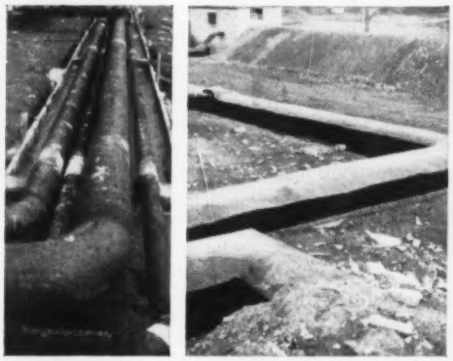
SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pa. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis

SPANG
CW
STEEL PIPE

EVEN TOUGH JOBS ARE EASY for "Z"crete®



No pipe too small or too large to be insulated with Z-crete. Here in city streets a large utility installs a monstrous 30″ low pressure steam supply and 10″ return pipe. Both pipes are contained in a single Z-crete conduit.



A large tank farm pipe assembly insulated with Z-crete on grade. Some of the large Z-crete conduits are used as walkways. On several occasions area has been flooded with no harmful effect on permanent, efficient Z-crete.

In this large hospital area Z-crete effectively insulates the complicated piping system between all buildings. Special support block shapes can be manufactured to meet special needs. Z-crete conduit is in effect a supporting pipe sleeve.

these actual photographs show how Z-crete is solving the toughest job problems

What other insulation for underground piping offers all these superior advantages

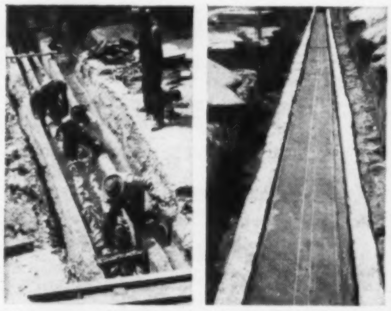
★ **MORE ADAPTABLE**—Z-crete is a field fabrication. Piping contractor has an easy-to-work-on concrete base pad for installing pipe. Pipes are installed—*then* insulated.

★ **MORE ECONOMICAL**—Low in cost, provides permanent and stable insulation. Especially economical in large-pipe or multiple-pipe installations.

★ **MORE EFFICIENT**—Z-crete's monolithic pour eliminates heat loss due to air movement. Six inches of insulation around pipe provides PLUS insulation value.

★ **PERMANENT**—Will not rot or deteriorate...water can't flow through Z-crete. Resilient, completely fire-proof.

★ **READILY AVAILABLE**—Z-crete materials are readily available from our many strategically located plants throughout the United States and Canada. Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U.S. Patent No. 2355966—Canadian Patent No. 439356. There is an applicator near you.



Many conduits are reinsulated with Z-crete. On this job water had ruined sectional pipe covering insulation. Pictures show before and after reinsulation. (Special pump equipment makes possible reinsulation with minimum of excavation.) It is economical to reinsulate in this manner if piping is good but insulation has deteriorated.

"Z"crete
DIVISION
Zonolite Company

Write for FREE Booklet

Zonolite Company, Dept. HPAC-25
135 S. LaSalle St., Chicago 3, Ill.

Please rush free Z-crete Booklet Z-11 with full details about this easier, better insulation of underground heated piping.

Name..

Address..

City.............................*Zone*....*State*.............

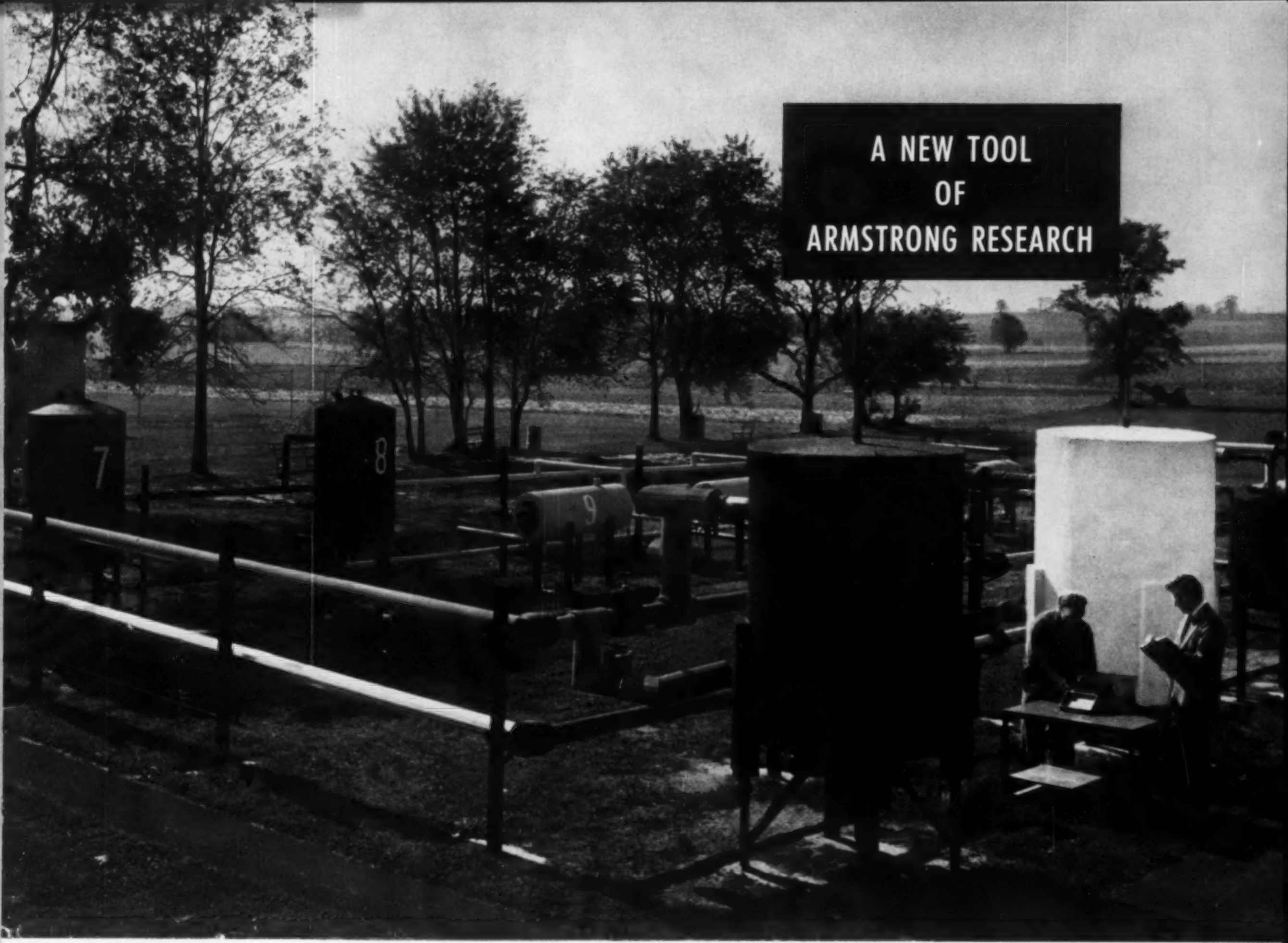
Zallea-designed Expansion Joints assure positive protection from damage caused by pipe movement. The units shown here—gimbal, hinged, and universal types—absorb pipe movements in any direction, imposing minimum forces on adjacent piping, equipment and anchors. An original Zallea development, gimbal expansion joints permit angular movement in any plane, with gimbal ring and hinges built to withstand pressure thrust and to support piping.

Zallea already has, or will design, expansion joints for every service—and to suit any piping layout. Test records show that Zallea Expansion Joints outlast all other packless joints by as much as 1800%. For information on standard types, or consultation on special expansion or piping problems, ask to have a Zallea representative call.

Zallea *expansion joints*

ZALLEA BROTHERS, 816 LOCUST STREET, WILMINGTON 99, DELAWARE

World's Largest Manufacturers of Expansion Joints



Tank Farm . . . *ideas grow into insulation specifications at this unique testing unit*

To study scientifically the effects of weather on insulations and protective finishes, Armstrong recently built a unique outdoor Tank Farm. Here, new and old insulation specifications and materials are evaluated under field operating conditions. Both high and low temperatures are held in a variety of pressurized, commercial and domestic oil tanks, and in a wide assortment of pipe lines.

The Tank Farm's equipment is extremely flexible so that insulation can be applied by one method and, if desired, replaced at any time to meet a completely different specification. Tests indicate which materials and methods warrant further development to replace current specifications.

This Tank Farm is but one example of how Armstrong Research is constantly working to improve industrial insulation materials and to develop simpler, more economical specifications. For full details on the Armstrong Line of industrial insulations and complete Contract Service, call your nearest Armstrong office or write Armstrong Cork Company, 206 Stratton St., Lancaster, Pennsylvania.

Study of new insulations, finishes, and methods of applying them is a continuous program of Armstrong Research. A new specification for applying corkboard is being made ready for testing on this experimental low-temperature tank.

Armstrong INDUSTRIAL INSULATIONS

BARBER COLMAN

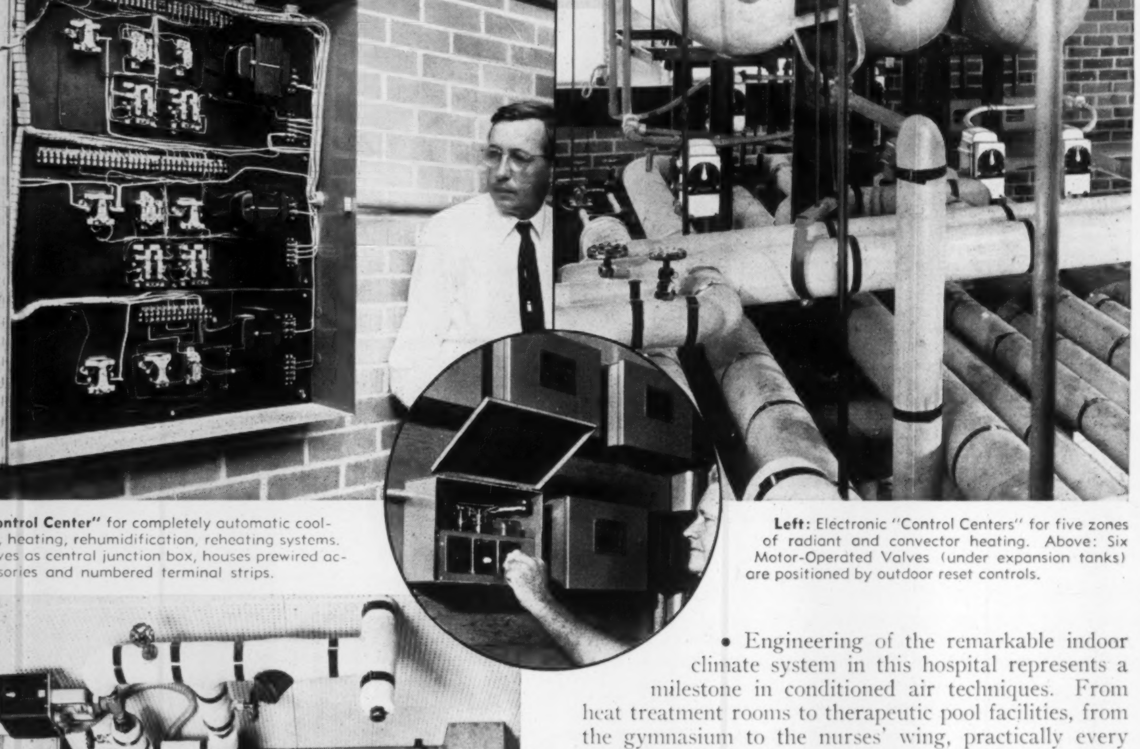
ELECTRIC

Control Center

better control . . . electrically . . . at Crippled Children's Hospital

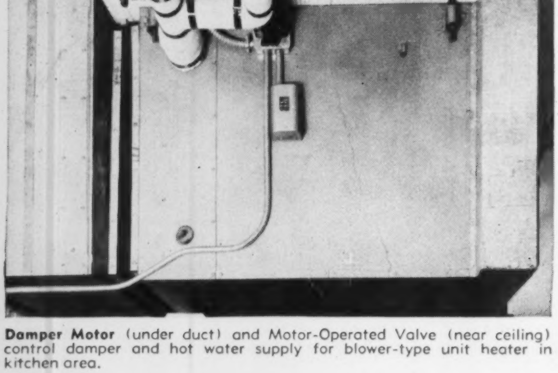
Primary objectives . . . simplicity, sensitivity, sustained accuracy, and low cost . . . were achieved in the advanced control system at Crippled Children's Hospital in New Orleans. Combining electric and electronic controls . . . using modern "Control Center" installation methods . . . in a low, rambling building where power lines are available everywhere . . . exacting temperature and humidity conditions are maintained in areas with widely differing requirements. As much as 50% was saved on installing labor. Maintenance is at a minimum, due to simplicity of the systems and their components. It's another example where "*better* control . . . electrically" pays off!

Architects-Engineers: RICCIUTI, STOFFLE & ASSOCIATES. *Associate-in-Charge:* J. BUCHANAN BLITCH. *Structural Engineer-in-Charge:* LOUIS J. ROSENBOHM, JR. *Mechanical Engineer-in-Charge:* ED. W. PENEGUY. *Consulting Electrical Engineer:* LOUIS N. GOODMAN & ASSOCIATES. *Mechanical Contractor:* CABIRAC MECHANICAL CONTRACTORS, INC. *Electrical Contractor:* WEISFELD & SON. *Sheet Metal Contractor:* BLATTMAN SHEET METAL WORKS (Uni-Flo Air Distribution Equipment used throughout hospital).



"Control Center" for completely automatic cooling, heating, rehumidification, reheating systems. Serves as central junction box, houses prewired accessories and numbered terminal strips.

Left: Electronic "Control Centers" for five zones of radiant and convector heating. Above: Six Motor-Operated Valves (under expansion tanks) are positioned by outdoor reset controls.



Damper Motor (under duct) and Motor-Operated Valve (near ceiling) control damper and hot water supply for blower-type unit heater in kitchen area.

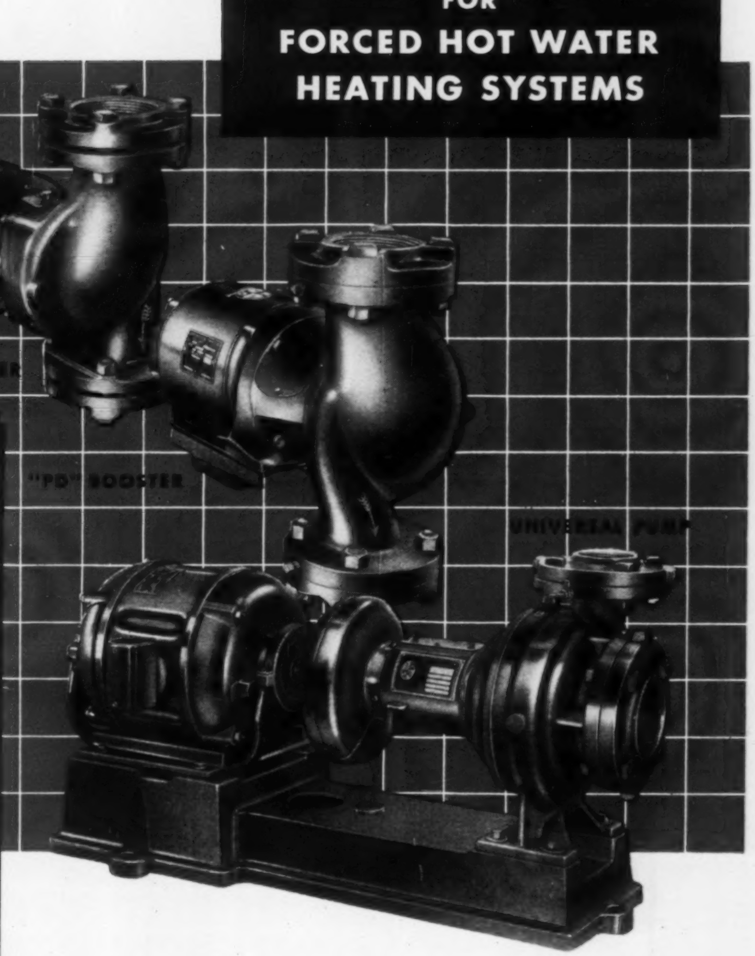
• Engineering of the remarkable indoor climate system in this hospital represents a milestone in conditioned air techniques. From heat treatment rooms to therapeutic pool facilities, from the gymnasium to the nurses' wing, practically every room had different temperature and humidity requirements. Even though every modern control feature was employed to solve these problems, the simplified automatic electric and electronic systems cost less to buy, operate, and maintain. You, too, can offer "*better* control . . . electrically!" Phone your nearby Field Office, or write us for data, prices, and expert engineering assistance on any automatic control problem.

Barber-Colman Company

DEPT. O, 1301 ROCK ST., ROCKFORD, ILLINOIS, U. S. A.
Field Offices in principal cities

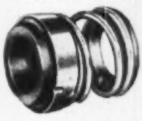
Automatic Controls • Air Distribution Products • Industrial Instruments
Aircraft Controls • Small Motors • Overdoors and Operators • Molded
Products • Metal Cutting Tools • Machine Tools • Textile Machinery

DESIGNED SPECIFICALLY FOR FORCED HOT WATER HEATING SYSTEMS



QUIET!

These design features will show you why B & G Pumps have an outstanding record for years of quiet, failure-proof performance.



SEAL

Leak-proof! Made of extremely hard material for long life.

SHAFT

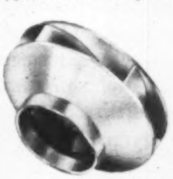
Special alloy steel—oversized! Integral heat-treated collar prevents end-thrust—prolongs seal and motor bearing life.

BEARINGS

Extra-long, bronze sleeve bearings are kept in a continuous bath of oil.

COUPLER

Spring-type, flexible coupler dampens noise.



IMPELLER

True centrifugal design, balanced for smooth, vibrationless operation.

A complete range of capacities for residences, apartment buildings, institutions, commercial and industrial buildings

Mere ability to meet a capacity and head requirement does not necessarily qualify a centrifugal pump for heating system application. Unless *quiet operation* is a built-in feature, the pump may be a potential source of trouble.

B & G Boosters and Universal Pumps are designed and built specifically to satisfy this prime requirement of forced hot water heating systems. In every detail they are constructed to assure *quiet operation... trouble-free performance... long life.* B & G Pumps have consistently proved their efficiency and dependability—thousands have been in operation for many years without need for service.

Bronze Boosters for service water installations

Where service water is to be circulated, operating conditions make necessary an all-bronze pump. For this purpose, all sizes of B & G Boosters are available as corrosion-resistant bronze units.

BELL & GOSSETT
COMPANY
Dept. DT-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

Which is the best way to air condition a CHURCH?

Carrier Duct System in First Baptist Church, Charlotte, N. C., has balcony-suspended outlets which spread a low blanket of conditioned air over congregation. Undisturbed upper air in dome acts as insulation, permitted use of smaller equipment.

Carrier Fan-coil Units are located around perimeter walls and at pew ends along center aisles in The Cathedral of the Sacred Heart, Dallas. This unique air distribution method made it possible to cut size of the air conditioning system from 125 to 83 tons.

Carrier Self-contained Units air condition beautiful old St. Paul's at Grosse Pointe Farms, Mich. Two 7½-ton Weathermakers are located in the choir loft, two are built into confessional booth cabinetwork. Church estimates $15,000 saving.

Carrier is the quickest way to the right answer

JUST 1–2 AND THE JOB IS THROUGH!

Carrier has *all* the ways to air condition *any* job—and all Carrier equipment is engineered to the same uniform standard. So short-cut hours of selection by (1) using the Carrier line as your shopping guide and then (2) comparing values. Get in touch with your Carrier dealer or distributor. He's listed in the Classified Telephone Directory. Or write to us directly. Carrier Corporation, Syracuse, New York.

Carrier air conditioning · refrigeration · industrial heating

HEAT ONLY THE OCCUPIED ROOMS—CUT FUEL COSTS with JOHNSON *DUAL* TEMPERATURE CONTROL

In most buildings today, certain offices continue to be occupied after regular working hours. Keeping those few offices comfortably warm, *without the expense of heating the entire building,* is a serious problem to building owners and managers. Installing separate steam mains is usually both impractical and too costly. Manual control of radiators in unoccupied offices is equally unsatisfactory.

The simple, effective answer to this "after-hours" heating problem is a modern *Dual* System of Johnson Automatic Temperature Control. Briefly, here's how it works:

During regular working hours, a Johnson *Dual* Thermostat in each office automatically maintains every space at the ideal comfort level. At the end of the day, all *Dual* Thermostats in the building may be reset, from a central control panel, to operate at *reduced, non-occupancy temperatures.*

In those offices which continue in use, merely pressing the button on the *Dual* Thermostat restores them to normal occupancy temperatures, *without changing the economy settings of the other thermostats in the building.*

Johnson *Dual* Control offers the finest in modern individual room temperature regulation—and at a tremendous reduction in fuel costs. Heating only the occupied rooms quickly saves enough fuel dollars to pay for the cost of the entire system!

These and many other important comfort and money-saving advantages of Johnson *Dual* Control are readily available to any new or existing building. Conversion of existing single temperature systems to Johnson *Dual* is both simple and inexpensive. An engineer from a nearby Johnson branch will gladly give you all the facts without obligation.

JOHNSON CONTROL
TEMPERATURE ⇅ AIR CONDITIONING

PLANNING • MANUFACTURING • INSTALLING • SINCE 1885

JOHNSON SERVICE COMPANY
507 E. Michigan St., Milwaukee 2, Wisconsin

I'd like more information about Johnson Dual Temperature Control.

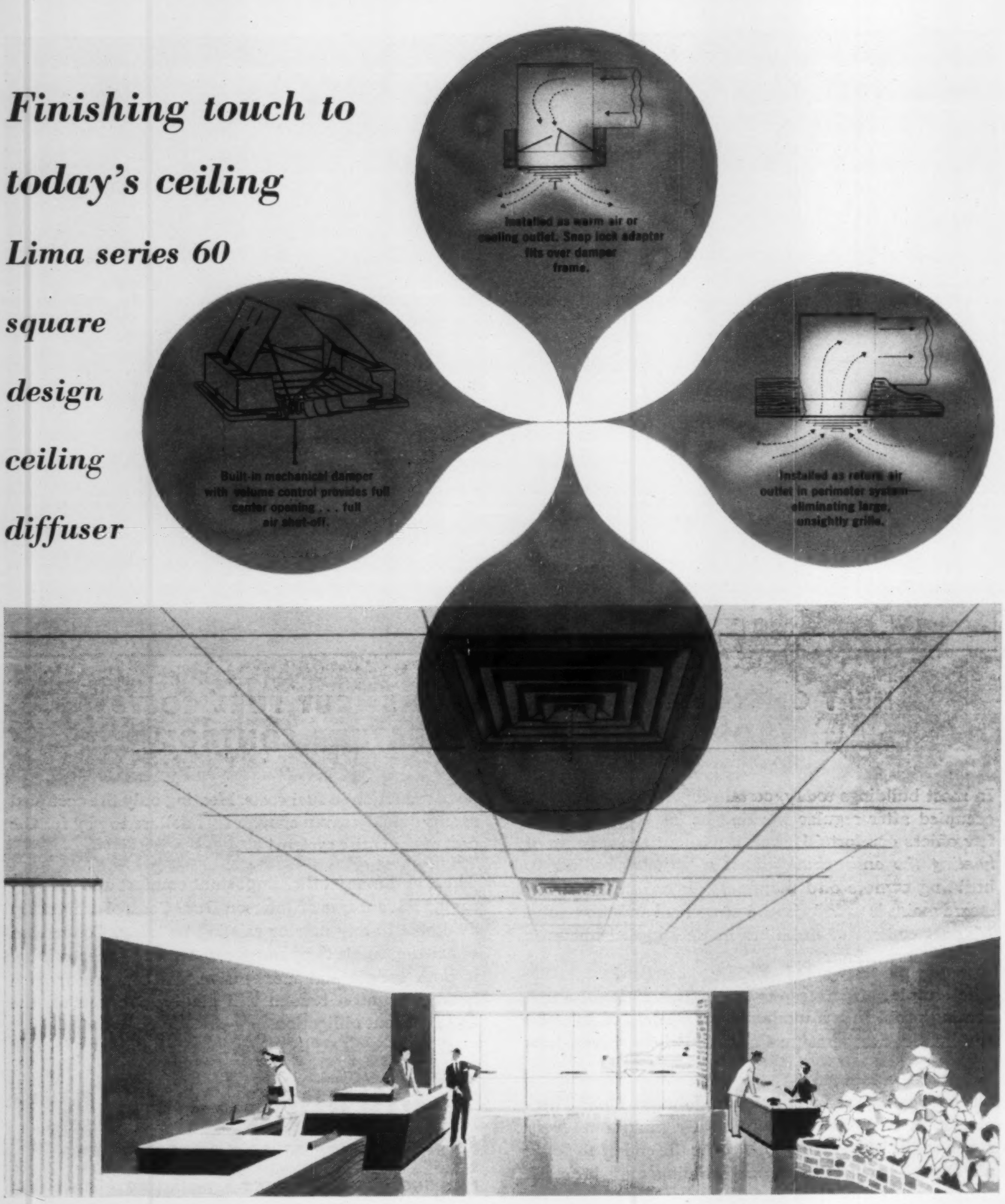
NAME______________________________

ADDRESS______________________________

CITY & STATE______________________________

Finishing touch to today's ceiling

Lima series 60 square design ceiling diffuser


Installed as warm air or
cooling outlet. Snap lock adapter
fits over damper
frame.
Built-in mechanical damper
with volume control provides full
center opening . . . full
air shut-off.
Installed as return air
outlet in perimeter system—
eliminating large,
unsightly grille.

✤ accentuates the beautiful symmetry of modern ceilings

When the specs call for a ceiling diffuser, you'll make your customer happier—and your job easier—by installing the Lima square design ceiling diffuser. It harmonizes beautifully with today's acoustical tile or block ceilings, and modern rectangular rooms. Light beige Lima finish is permanent and requires no repainting.

assures complete comfort in heating and cooling

The Lima-engineered square design and tiers of step-down vanes provide greater free area for more effective air diffusion in all directions at correct angles for complete indoor comfort—in heating and cooling. *Ask your jobber's salesman or write direct for new complete Lima catalog.*

Lima REGISTER COMPANY
LIMA, OHIO

Sold exclusively through heating wholesalers and manufacturers

Stocked for fast service to you!

7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

● Your nearby Youngstown Distributor carries a complete stock of good steel pipe, and he'll deliver your order quickly. That's an important help for you. It saves you time delays on jobs and the expense of carrying costly, excess inventory. For all your steel pipe needs, call your Youngstown Distributor.

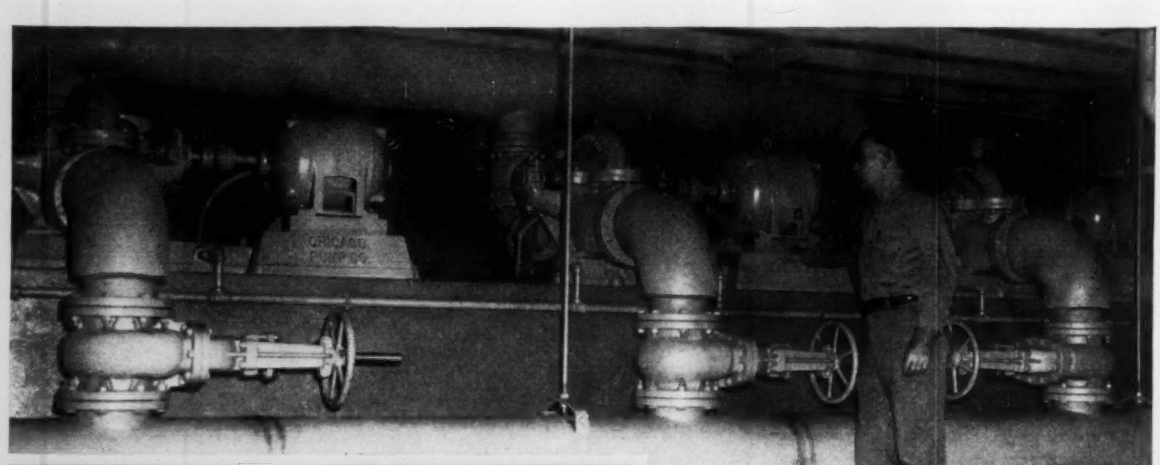
Youngstown

QUALITY YOUNGSTOWN SERVICE

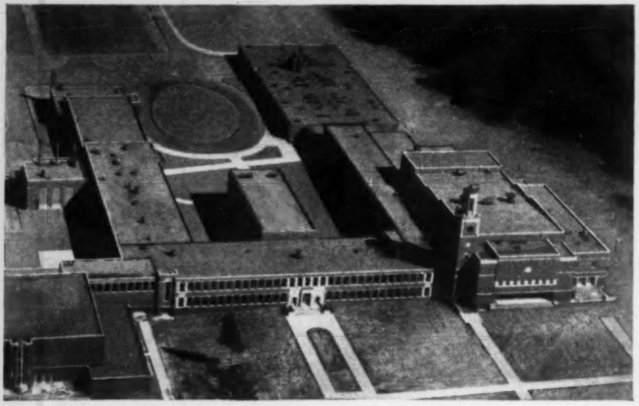
THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: Youngstown, Ohio - District Sales Offices in Principal Cities

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES



▲ Three Chicago Type D Centrifugal Pumps powered by 25 H. P. motors provide efficient hot water circulation at the Parma, Ohio, Senior High School. Two pumps handle normal loads, the third serves as a stand-by.



◀ The new Parma, Ohio, High School
Architects—Fulton, Krinsky and Dela Motte
Contractors—The Feldman Bros. Co.

QUALITY PAYS HERE . . .

Quality that pays off in the long run was the guiding thought when the Senior High School at Parma, Ohio, was built recently. Costing $5,000,000, the ultra-modern building houses educational facilities for more than 1,500 students. Several hundred rooms, ranging from classrooms to spacious auditoriums and gymnasiums, are heated with hot water circulated to convectors installed throughout the building.

Nothing was spared to make the heating plant efficient and trouble-free. According to Mr. George Rose, long-time heating engineer with the Parma Board of Education, who now operates the Parma heating system, "A 'packaged' heating system might have been adequate but we are already noticing better results from our custom installation."

It is significant that Chicago Pumps—the quality choice of leading architects, engineers and contractors for more than 40 years—are used for hot water circulation in this system. The reputation of Chicago Pumps for efficiency and dependability has earned them a place in many of today's outstanding buildings — for circulating, heating, bilge and sewage pumping. Full information is available on all types. Write for descriptive literature. Department A.

CHICAGO PUMP COMPANY

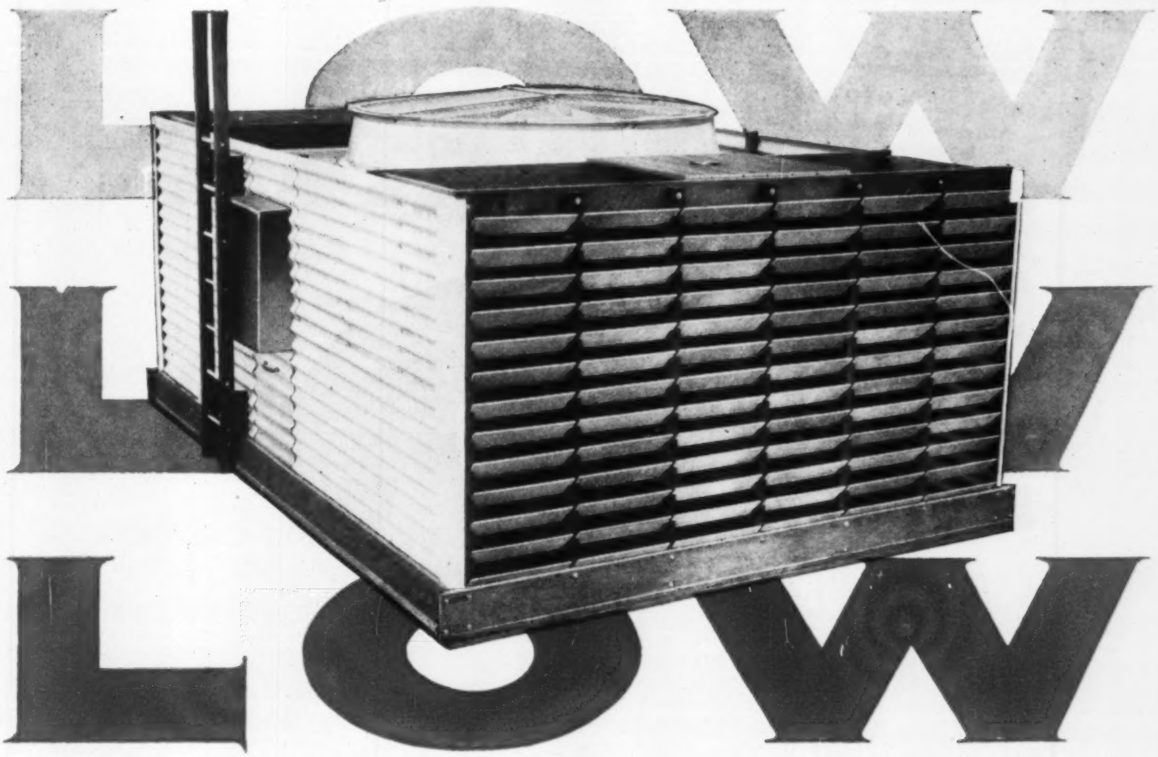
Subsidiary of Food Machinery and Chemical Corporation

BUILDING PUMP DEPARTMENT

622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Condo-Vac, Sure Return, AVC, LVC,
Fire, House & Circulating Pumps
Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors
Little Giant & Non-Clog Bilge Pumps
Pumps for every industrial use.



...AND BEHOLD!

THE

1955 Double-Flow Aquatower*

The Marley Double-Flow Aquatower, the unit that brought the low silhouette tower to the air conditioning and refrigeration industry, has been completely redesigned . . . to accentuate its compatability to architecture, to boost its already excellent performance.

New are the horizontal corrugated asbestos cement board end walls; new are the completely louvered sides. These two features give the Double-Flow Aquatower a much lower, more compact appearance and make the tower an integral part of the structure it serves. The new structural design effects marked economy in construction time and labor cost.

A distinctively different pattern of high-efficiency nailless filling is a 1955 feature. Air-handling ability of every Double-Flow Aquatower unit has been sharply increased. The combination of these two improvements means added performance for every frame size.

Double-Flow Aquatowers are offered in a complete range of capacities for either single or multi-cell installations. The Model 8 (pictured here) and its companion, the Model 12, fill every requirement for air conditioning and refrigeration. Get the entire story on these important improvements in water cooling from your nearby Marley engineering sales office.

*Trademark reg. Double-Flow design fully protected by U. S. Pat. Re 21794

MARLEY

The Marley Company

Kansas City, Missouri

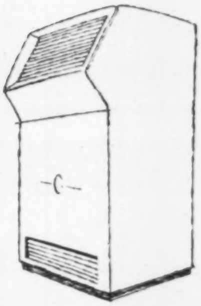
Wagner®
ELECTRIC MOTORS
. . . the choice of leaders in industry

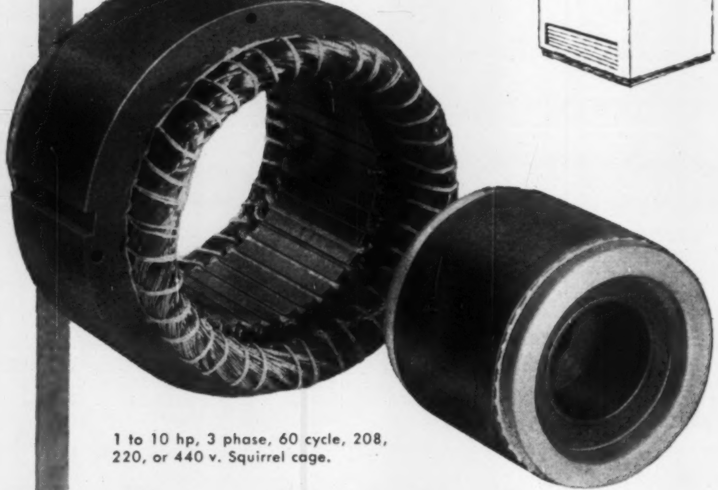
specify Wagner® HERMETIC MOTORS . . .

to provide the best in sealed-unit performance

POLYPHASE

For sealed refrigeration units, air conditioners, commercial refrigeration and similar applications.

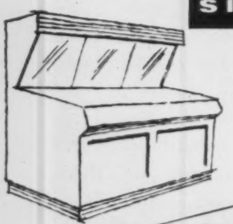




1 to 10 hp, 3 phase, 60 cycle, 208, 220, or 440 v. Squirrel cage.

For hermetically-sealed refrigeration units, freezers, compressors and similar equipment.

SINGLE-PHASE



¼ to 5 hp, 60 cycle, 115 or 230 v. Split Phase, Capacitor-start induction run, Capacitor-start and run.

When you design or build a hermetically-sealed air-conditioning refrigeration condensing unit—choose your motor drive with care. You can't afford to take chances. Remember it's *your product* that gets the blame if the motor fails.

Wagner hermetic motors, like Wagner general-purpose motors, are known for their ability to give years of trouble-free service. Refrigeration manufacturers who use Wagner hermetics know that each motor will meet their rigid requirements for quality, uniformity and dependability.

That's because every Wagner hermetic motor is precision-built and carefully tested. They are backed by more than sixty years of motor building experience.

When your motor drives are to be hermetically sealed, it's to your advantage to specify *Wagner* for use on your equipment. Get the facts . . . call the nearest of our 32 branch offices, or write us.

Wagner Electric Corporation
EST. WEC 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

- ELECTRIC MOTORS
- TRANSFORMERS
- INDUSTRIAL BRAKES
- AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

H55-5

SILENCE
FAN
AT WORK

We'd like to make a big noise about something quiet at Utility – our new silent Direct Drive Blowers specially designed with Neoprene hubs to cushion and isolate the motor noise so you have practically no-sound operation.

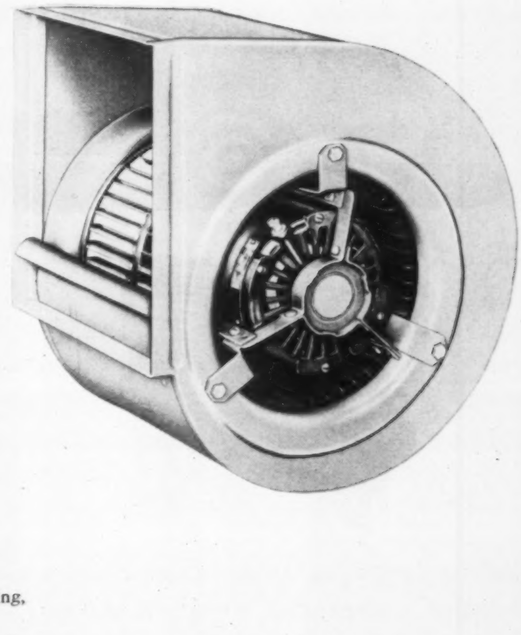
The Neoprene hub costs you nothing extra – proof again of Utility's quality engineering combined with quantity pricing.

The first to produce this far-advanced feature, Utility consistently pioneers in high speed production development to give you the best products in its field at lowest cost.

Utility's Direct Drive Blowers are adaptable to the manufacture of heating, cooling, refrigerating and ventilating equipment. These blowers require less space, have no unnecessary accessories and can be speed-controlled easily.

Check Utility for blowers, blower parts or any combination of parts – and discover for yourself . . .

YOU CAN'T MATCH UTILITY FOR PRODUCT AND PRICE



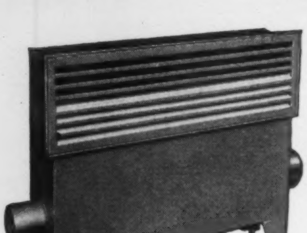
A Division of Utility Appliance Corporation
UTILITY FAN CORPORATION
911 East 59th Street, Los Angeles 1, California

Producers of blowers and blower parts for original equipment manufacturers. Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Write for catalogue data.

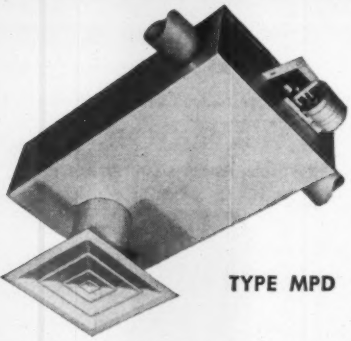
Air Conditioning Systems
are on a diet...

thanks to

Tuttle & Bailey
High Pressure
Air Distribution
Units



TYPE MPW



TYPE MPD

T&B HIGH PRESSURE INSTALLATIONS INCLUDE: Bethlehem Steel Co., Bethlehem, Pa. • Dallas County Building, Dallas, Texas Dearborn Bank, Dearborn, Mich. • Decatur-Macon County Hospital, Decatur, Ill. • General Telephone Exchange, Chicago, Ill.

If you can reduce the space you need for an air conditioning system, you can obviously effect substantial savings in the over-all cost of a building. With a high pressure air conditioning system, you can do just that.

Small, low-cost conduit-type risers and branch feeders add more usable or rentable floor space, reduce floor-to-floor dimensions, and require fewer supplementary equipment rooms.

High pressure is the ideal type of air conditioning system for new multi-story office buildings, schools, hospitals, hotels, and institutions. It is also *particularly* well suited to installation in existing buildings where high pressure eliminates the need for major remodeling. In fact, in many older buildings, such a system is the *only* answer to air conditioning.

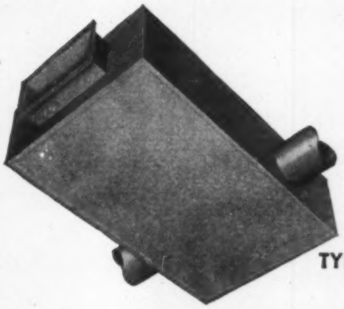
A pioneer in the development of the high pressure theory, Tuttle & Bailey manufactures a complete line of equipment to meet the varied requirements of a wide range of buildings and types of construction. Tuttle & Bailey Units include single and double duct wall and ceiling types for individual unit or zone control, and are capable of handling branch duct velocities up to 4000 feet per minute.

The units shown below typify the Tuttle & Bailey line which is backed by extensive on-the-job experience, and one of the best-equipped Research Laboratories in the industry where T&B engineers can duplicate field conditions and pretest equipment and thus offer maximum assistance to architects and engineers.

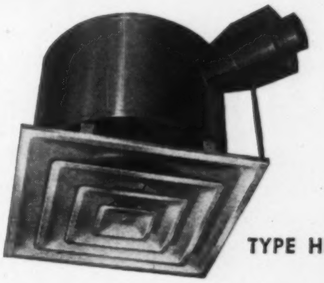
To learn how you can take advantage of Tuttle & Bailey's high pressure know-how, get in touch with your nearest T&B Representative or the Home Office.

For information on the complete line of Tuttle & Bailey High Pressure Air Distribution Units, write for Bulletin 109.

TUTTLE & BAILEY inc
NEW BRITAIN, CONN.

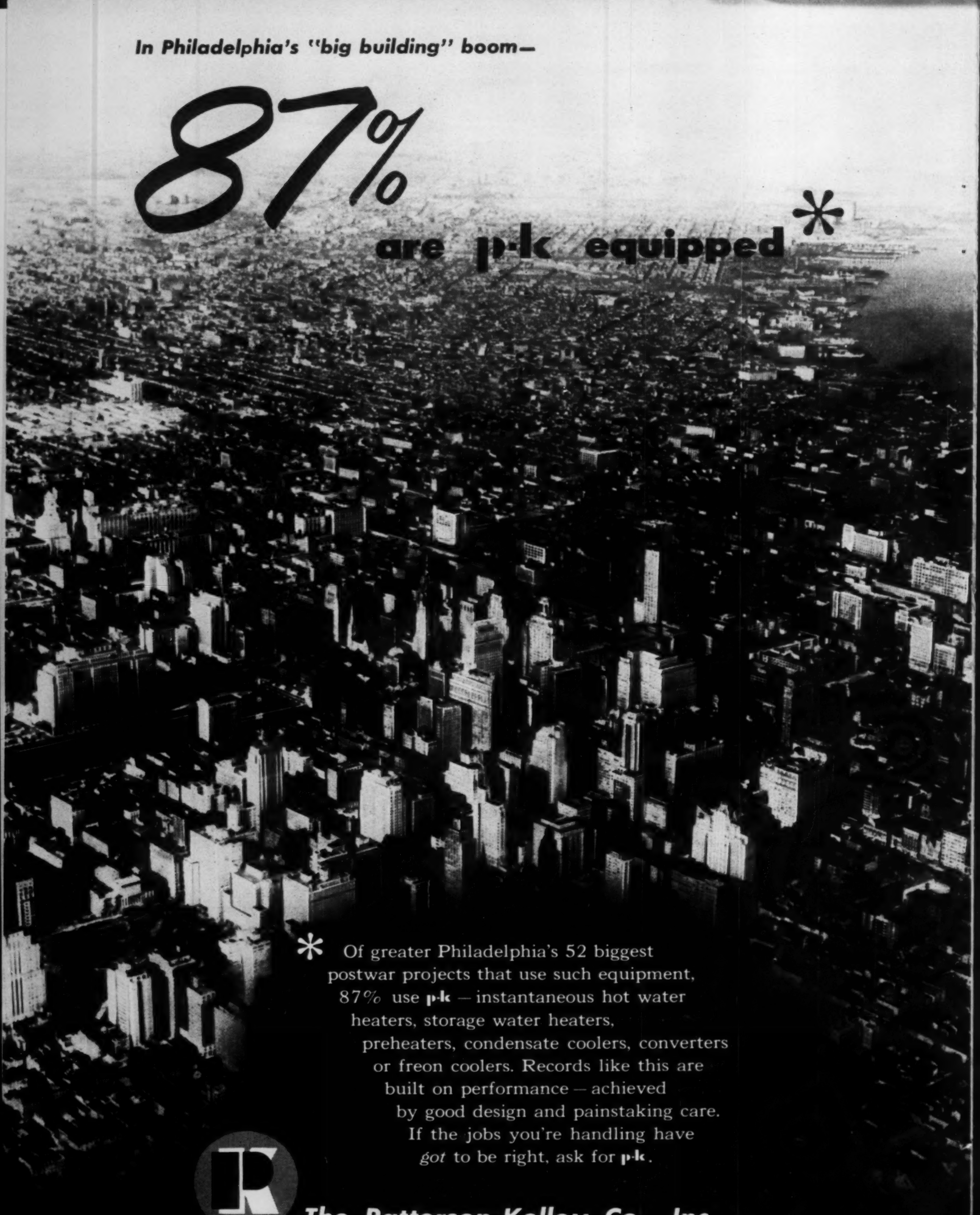


TYPE MP



TYPE HPD

IBM World Headquarters, New York, N.Y. • Latter Day Saints Society Building, Salt Lake City, Utah • Lever House, New York, N.Y.
People's National Bank, Little Rock, Ark. • Seamen's Bank for Savings, New York, N.Y. • Sinclair Oil Building, Tulsa, Okla.



In Philadelphia's "big building" boom—

87%

are p·k equipped*

* Of greater Philadelphia's 52 biggest postwar projects that use such equipment, 87% use **p·k** – instantaneous hot water heaters, storage water heaters, preheaters, condensate coolers, converters or freon coolers. Records like this are built on performance – achieved by good design and painstaking care. If the jobs you're handling have *got* to be right, ask for **p·k**.

The Patterson-Kelley Co., Inc.
East Stroudsburg, Penna.

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

Again
ORR & SEMBOWER
Leads . . .

PAY as you SAVE

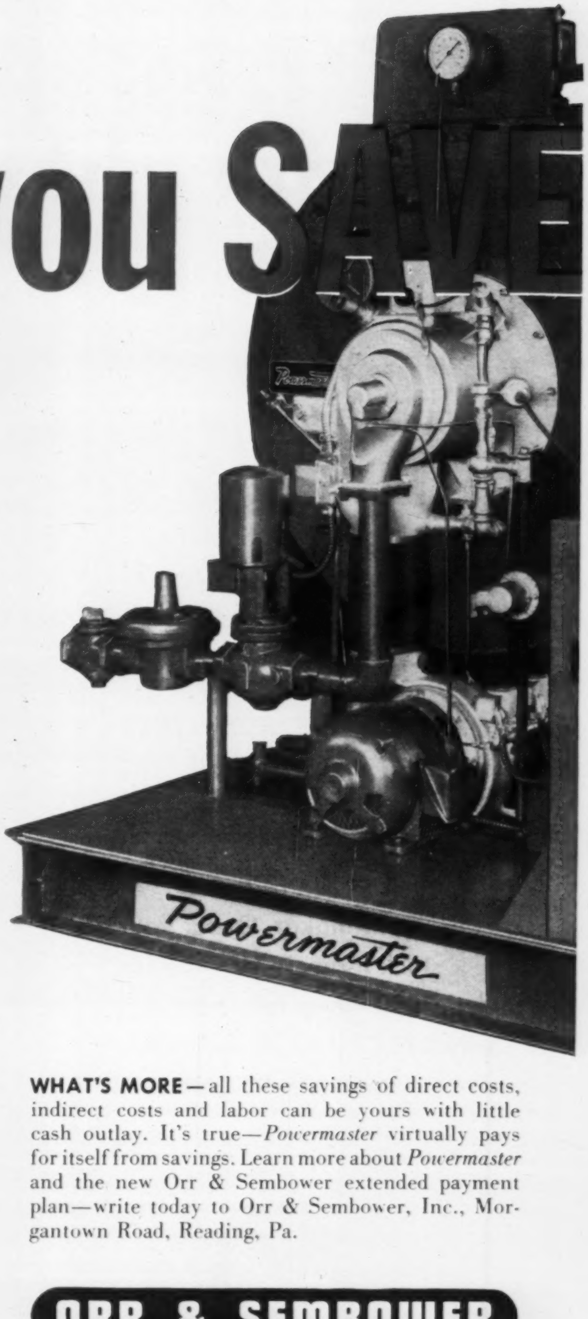
PACKAGED STEAM

RIGHT NOW is the time to get all the operating advantages of O&S *Powermaster®* Packaged Automatic Boilers *without* high capital investment. Pioneers in the packaged steam field, O&S now offers a new extended payment purchase plan that gives you more and more savings.

HERE'S HOW YOU SAVE:

- Save on fuel and time through real operating efficiency with a *new* packaged steam plan.
- Save on down-time and maintenance expense.
- Save on taxes if your existing boiler cost has been completely amortized. This saving is especially important with the "sum of the digits" method of figuring depreciation provided in the new tax law.
- Save on fuel costs because you can instantly change from gas to oils of any grade to meet delivery or economic conditions.
- Save on space by *Powermaster's* extra-compact design.
- Save on initial investment because you can get *exactly* the size and capacity boiler required for your needs. *Powermaster* is available in a full range of sizes from 15 to 500 hp., 15 to 250 psi. steam or hot water.
- Save on installation costs and time because a *Powermaster* "goes in" anywhere quickly, easily.

Powermaster is your best bet because only O&S offers you undivided responsibility for every package. All components are made in the O&S factory—are guaranteed by Orr & Sembower, backed by more than 85 years reputation.



WHAT'S MORE—all these savings of direct costs, indirect costs and labor can be yours with little cash outlay. It's true—*Powermaster* virtually pays for itself from savings. Learn more about *Powermaster* and the new Orr & Sembower extended payment plan—write today to Orr & Sembower, Inc., Morgantown Road, Reading, Pa.

ORR & SEMBOWER
Powermaster®
PACKAGED AUTOMATIC BOILERS
In sizes to 500 HP; pressures to 250 psi.

The NEW 3 R's for CONTINENTAL AIR FILTER USERS

1. Rinse
2. Re-use
3. Repeat

NEW SYNTHETIC MEDIA AROUSES TRADE'S INTEREST

Quick and widespread response to recent introduction of Continental's *new* and *different* DYCON DY filter indicates it fills a long-standing need for a service-easy, clean filter.

NO OIL or MESSY ADHESIVES with DYCON DY!

DYCON DY pricing offers you an advantageous discount. Cut yourself in on this profit-maker. Order your stock today — or write for Bulletin 550 which tells how and why DYCON DY 1-inch filters are a better buy.

with

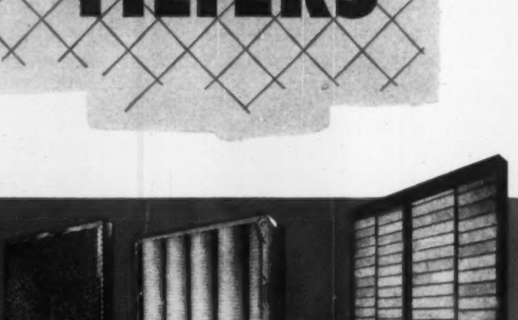
DYCON

TYPE DY 1-INCH

DRY AIR FILTERS

P.O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL AIR FILTERS Inc.



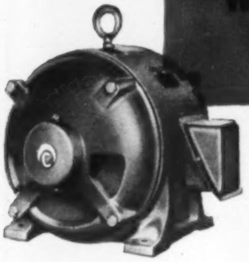
Two Century motors installed on an air conditioning and heating system serving a 10-story office building.

THE QUIET POWER

OF *Century* MOTORS

WILL HELP KEEP YOUR CUSTOMERS HAPPY

•792



To assure quiet starting and efficient, dependable operation manufacturers do two things. They engineer their equipment skillfully *and* they choose motors carefully to bring out the best performance in their equipment.

Many leading manufacturers of heating, ventilating and air conditioning equipment depend on Century motors. They have found that Century's wide range of motor sizes and types helps them select motors that are exactly right for every job.

Century motor-power on the equipment you install is your first step toward complete customer satisfaction. Remember, Century's nationwide network of Branch Offices and Authorized Distributors is always at your service to help you with your motor problems.

400 TO 1/8 HORSEPOWER

Century C MOTORS

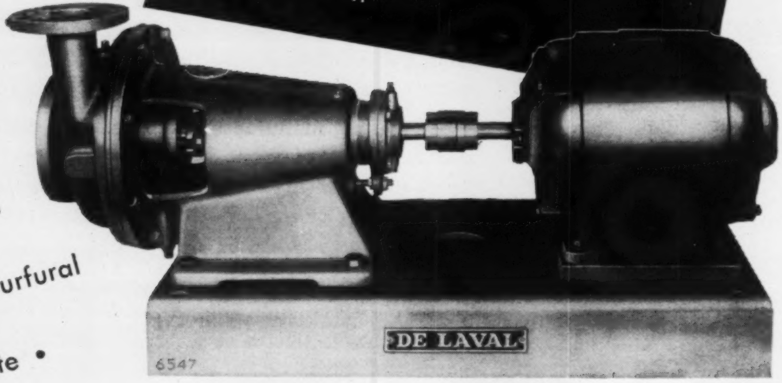
CENTURY ELECTRIC COMPANY
1806 Pine Street, St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

• Calcium chloride brine • Flushing liquor
Sodium sulphate • Asbestos fiber & cement mix • Green liquor •
Soap solution • Grinder coolant • Carbon slurry • Cane wash • Salt brine • Sea water •
• Caustic solution • Bleach liquor • Grape juice concentrate • Tomato juice concentrate •
Tomato puree • Propanol • Soap liquor • Cane juice • Aqueous lime • Coke oven oil •
• Paper stock • Waste sulphite liquor • Alkylaryl sulfonate • Sugar liquor • Vinyl pyridine
• Saturated brine • Grape juice • Tomato juice • Press liquor • Calcium bisulphite • Melt
Phenolized ammonia • Ammonia liquor • Sulphuric acid • Paraffine oil and water • Sludge
• Milk waste • Gritty water • Cane syrup • Lime & soda solution • Cachaza • Clear juice
White water • Mineral oil • Chromic acid Cement • Gasoline • Depanol
Brine • Vegetable oil • Licorice liquor • Flume water •
• River water • Benzine thinner • Mash
Methylene chloride • Sodium hydroxide
Sizing solution • Alcohol •
• Steep soda • Caustic soda
Black liquor • Ethylene glycol
• Fuel oil • Furfural
• Condensate •

One pump handles all these liquids...

DE LAVAL
CPO PROCESS PUMP

CAPACITIES TO 2,000 GPM
HEADS TO 200 FT.



DE LAVAL *Centrifugal Pumps*

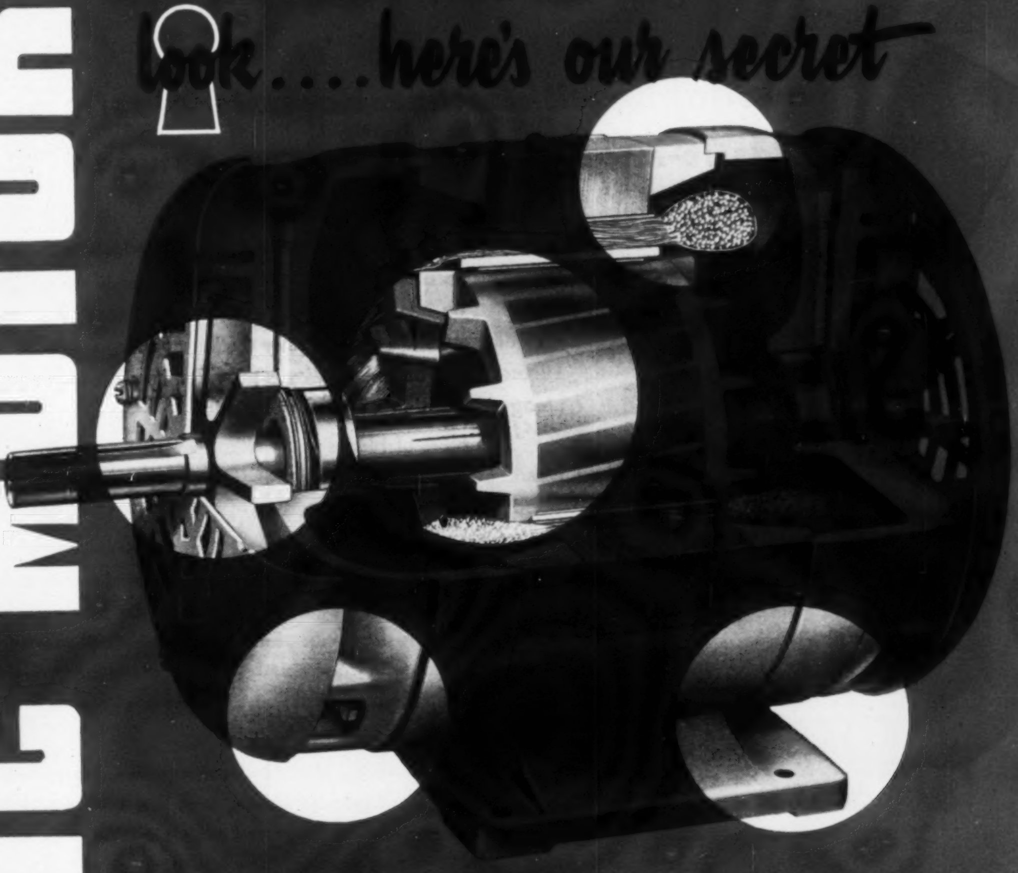
DE LAVAL STEAM TURBINE COMPANY
871 Nottingham Way, Trenton 2, New Jersey

DL 281

WRITE FOR BULLETIN 1125-B

BALTRIC MOTORS

look.... here's our secret



The new *Streamcooled* Baltric line of fully enclosed motors are better because they bring you power-houses in a more compact package. And this cutaway drawing shows you how our engineers combined the newest developments and newest materials to get more motor into less bulk. The *Streamcooled* Baltric line doesn't waste an inch or an ounce. These motors are easier to install, easier to handle . . . bring you modern efficiency and performance.

See how the rugged Unicast stator frame combines steel laminations in an aluminum alloy casting to get greater stability, rigidity. Improved insulation permits better slot design for copper windings. Improved techniques produce balanced, stress-free rotors. *Every* detail of design and construction is calculated to reduce size and weight without sacrificing performance and efficiency.

And Baldor has done just that. Built a better motor. *Streamcooled* Baltric's your best bet . . . doesn't waste space . . . doesn't waste weight . . . easier to handle and install. 8850-1

Original Streamcooled Baldor Motors Available—Built to Former NEMA Standards

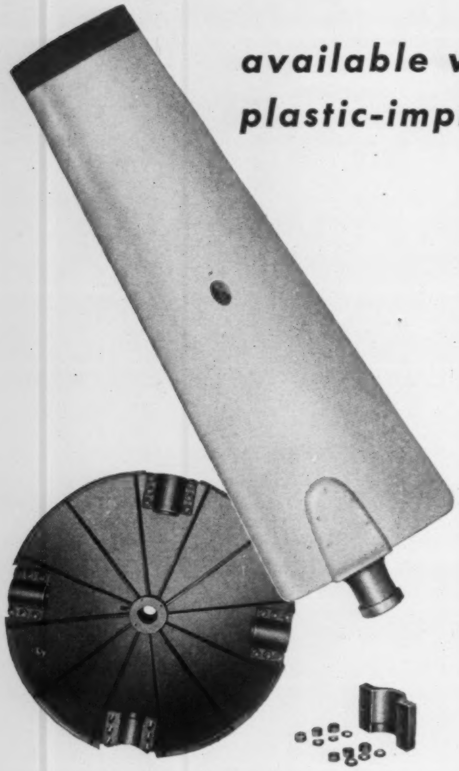
BALDOR ELECTRIC COMPANY

Baltric Motors Are Available in Polyphase • Squirrel Cage Induction and Single Phase • Capacitor Start • Induction Run Types

4350 DUNCAN AVENUE • ST. LOUIS 10, MISSOURI

New tapered-blade design boosts efficiency, increases strength of Hartzell cooling tower fans

available with either Hartzite plastic or new plastic-impregnated laminated wood blades



Greater efficiency and increased rigidity which reduces sag to a minimum result from Hartzell's new tapered-blade design. Blades now used on all cooling tower and heat exchanger fans in 14 to 22 foot diameters are considerably thicker at the shank than at the tip. Further strength and rigidity is provided by a rib-like reinforcement along the leading edge of the blade.

Two types of blades are available in the new design — Hartzite plastic blades as on the older designs and new plastic-impregnated wood blades.

For maximum durability and length of life, Hartzite plastic blades should be used. Fabric-reinforced Hartzite has been proved in thousands of installations since 1941 as the blade material most resistant to corrosion, vibration and abrasion. However, the new plastic-impregnated wood blades show remarkable resistance to deterioration and their initial cost will be less than that of Hartzite blades.

Both blades are of laminated construction. Hartzite blades are laminated of cured plastic sheets, and the new wood blades of 1/16″ maple or birch impregnated with a special resin and covered with a plastic-setting coating. The leading edge of the wood blades is covered with an aircraft-type neoprene boot to increase resistance to abrasion.

Taper is achieved by reducing the number of laminations. A blade from a 14 foot assembly tapers from 1½″ (14 laminations) at the shank to ¼″ (3 laminations) at the tip.

For complete details on these rugged new fans, write today for your free copy of Bulletin A-111A.

This cross section cut from a laminated Hartzite plastic blade shows the heavy reinforcing rib along the leading edge.

HARTZELL *propeller fan co.*

Div. of Castle Hills Corp.

Please send me a copy of Bulletin A-111A, "Hartzell Cooling Tower and Heat Exchanger Fans."

Name ____________________

Company ____________________

Street & Number ____________________

City & State ____________________

If student, check here for special information ☐

Dept. V

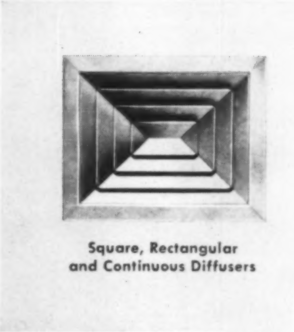
PIQUA, OHIO

PROPELLER-TYPE FANS • BLOWERS
ROOF VENTILATORS • UNIT HEATERS

ENGINEERING OFFICES IN PRINCIPAL CITIES

Baker 539-1

for
any
job
condition... it's AGITAIR® for better air



Square, Rectangular
and Continuous Diffusers

Circular
Adjustable and Non-Adjustable
Diffusers

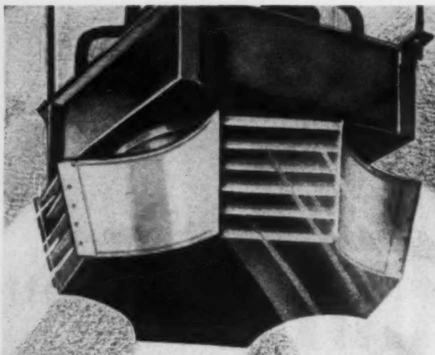
Stripline
Sectional and Continuous
Diffusers

Choose the AGITAIR that best suits your needs—and feel secure that whichever you choose is outstanding for quality, design, service and dependability. AGITAIR is recognized as a pioneer in the development and manufacture of air diffusers... with more years of air diffuser "Know How" than any other manufacturer. Look around—you'll see AGITAIR everywhere... coast-to-coast... and throughout the world.

AIR DEVICES INC.

185 MADISON AVENUE, NEW YORK 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS



Wing

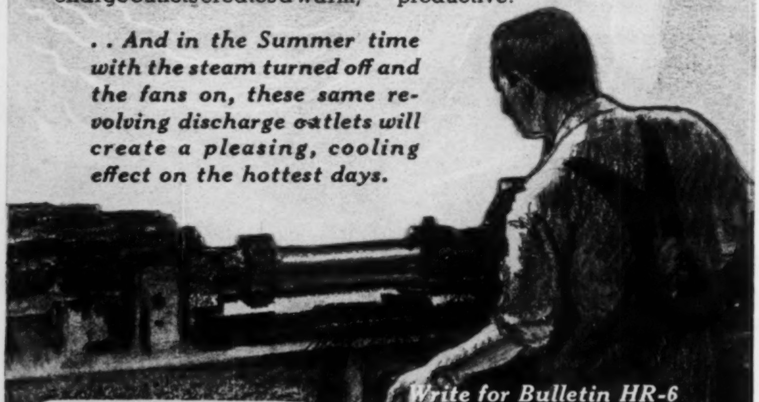
REVOLVING UNIT HEATERS

The Moving Airstream Touches the Worker for only a few Seconds at a Time

NO SICKENING HOT BLAST!

THAT is the big difference between most unit heaters and the WING Revolving Heater. The soft airstream from the slowly revolving discharge outlets creates a warm, gentle, yet live sensation of comfortable well-being that is without equal for keeping workers contented and productive.

. . And in the Summer time with the steam turned off and the fans on, these same revolving discharge outlets will create a pleasing, cooling effect on the hottest days.



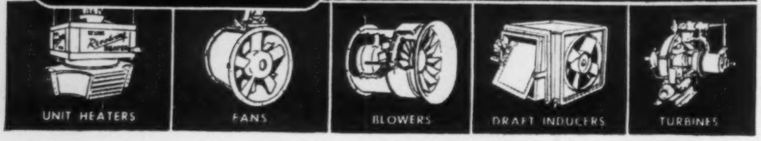
Write for Bulletin HR-6

Wing

L. J. Wing Mfg. Co.

140 Vreeland Mills Road, Linden, N. J.

Factories: Linden, N.J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium



WeldELLS® *have everything*

6" 150
TF
TAYLOR

Yes, Taylor Forge made the forged steel flange and the forged steel flange made Taylor Forge. The perfected welding neck flange, illustrated here, was pioneered by Taylor Forge and is a part of the superlative WeldELL® line.

See your Taylor Forge Distributor for up-to-the-minute facts.

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS • General Offices and Works: P.O. Box 485, Chicago 90, Illinois
Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ontario, Canada

Through Evolution to Revolution

In 1929 Taylor Forge announced the first line of welding neck flanges. Although modestly presented at the time, this later proved to be a revolutionary development . . . the forerunner of all butt-welding fittings.

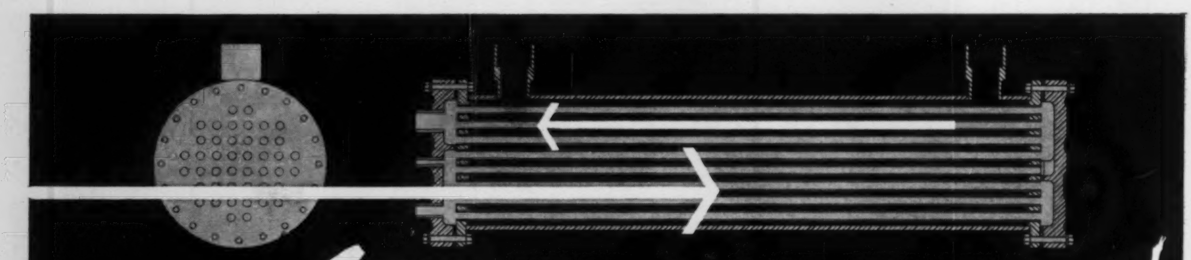
Actually the welding neck flange was an evolution of Taylor forged steel flange production which had paced the dramatic rise of pressures that started early in the century. The first call from the power and process industries for better ways of containing pressures came as far back as 1910. It was then that the first blow was struck at corrosion and weakness by the Van Stone joint, subsequently perfected by Taylor lap joint flanges and stub ends.

This was the ultimate in pipe joining until torch welding replaced forge welding. Taylor Forge foresaw the possibilities of the torch, and its later affiliate, arc welding. Old timers here like to recall that Taylor Forge was first in Chicago to experiment with oxyacetylene welding as far back as 1905 when the process was brought to this country from France, and that Taylor Forge was also among the early pioneers in metallic arc welding.

It was therefore a "natural" for Taylor Forge to be ready, when on-the-job welding became commercially practical, with the first flange designed for butt welding—the welding neck flange. Taylor Forge thought of it as merely one part of the development of the WeldELL line which had begun in 1926 and was announced shortly after the welding neck flange.

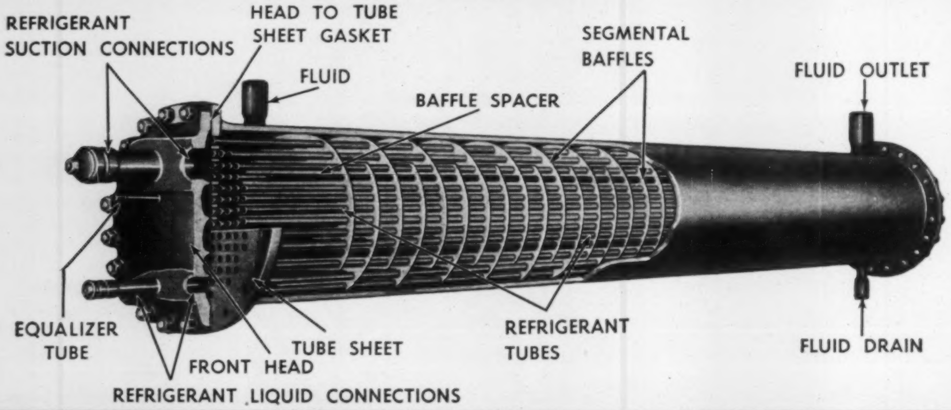
Pressure piping had gone through evolution to revolution.

An episode in the story of
Taylor Forge leadership in designed piping



Acme straight as an arrow THROUGH TUBE CONSTRUCTION

one reason why you should specify Acme DRY-EX® LIQUID CHILLERS for efficient performance


REFRIGERANT SUCTION CONNECTIONS
HEAD TO TUBE SHEET GASKET
FLUID
BAFFLE SPACER
SEGMENTAL BAFFLES
FLUID OUTLET
EQUALIZER TUBE
TUBE SHEET
FRONT HEAD
REFRIGERANT LIQUID CONNECTIONS
REFRIGERANT TUBES
FLUID DRAIN

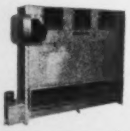
The straight as an arrow full size tubes of Acme-originated Dry-Ex Liquid Chillers have no curves, no bends, no welds. With multipass heads at each end of the tubes, a clear, unobstructed passage is provided for high velocity flow of refrigerants. The above features provide maximum heat transfer area for guaranteed efficiency and compactness. Oil return is positive. Refrigerant tubes are cleanable. Individual tubes *can* be replaced if rupture is ever caused through system control failure.

Other features include factory specified baffle spacing to fit job requirements exactly. Cast steel refrigerant heads are stocked in a range of perfected pass designs to solve all types of single and multiple-circuit needs.

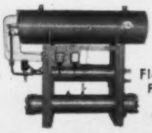
Dry-Ex Chillers are made in 1 to 200 ton capacities, with over 700 baffle and shell combinations available. Acme, original manufacturer of direct expansion type chillers 18 years ago, produces more Dry-Ex type liquid chillers than all other manufacturers combined.

Dry-Ex is Serving Firms Like These —

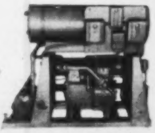
Bell & Howell Co.
Libby-Owens-Ford
Santa Fe Railway Co.
Johns Manville
Bohn Aluminum & Brass Corp.
Container Corporation
Minneapolis-Honeywell
Giddings & Lewis
Gates Rubber Co.
Raytheon Co.
Ohio Edison Co.



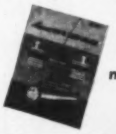
Acme Cooling Towers and Evaporative Condensers



Flow-Therm® Packaged Liquid Chillers



Flow-Cold® Packaged Liquid Chillers



Write for new Acme Dry-Ex Catalog.

WORKING WITH ARCHITECTS, ENGINEERS AND MANUFACTURERS ON AIR CONDITIONING AND REFRIGERATION SINCE 1919

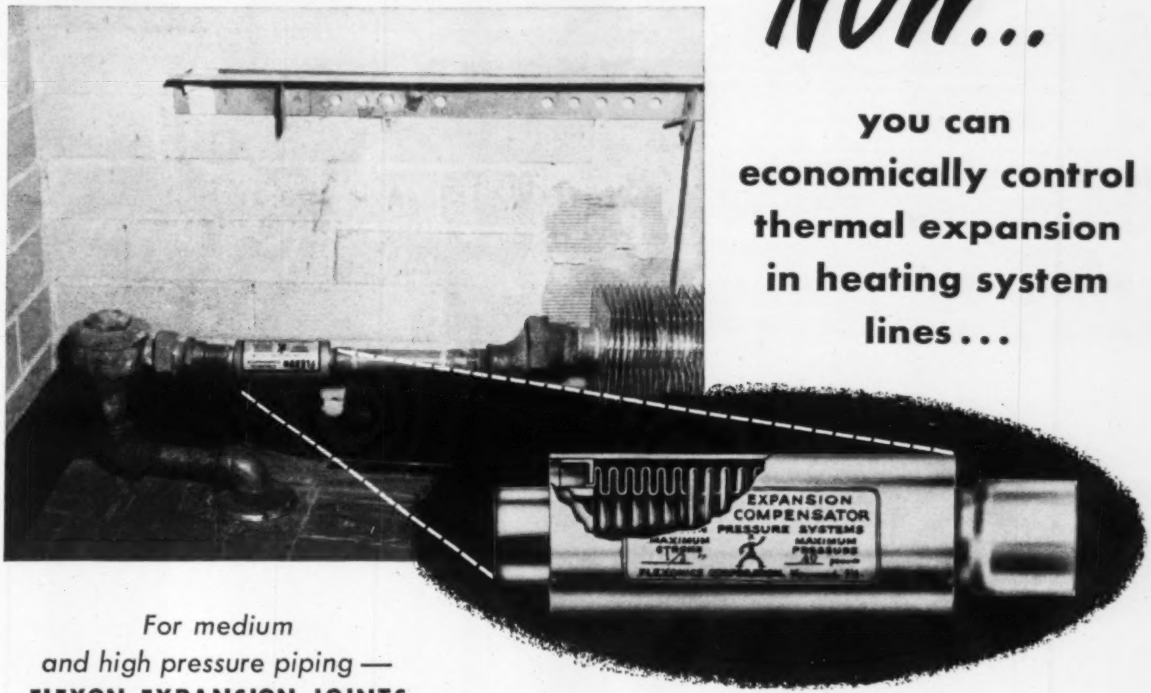
ACME INDUSTRIES, INC.

JACKSON, MICHIGAN

ACME
AIR CONDITIONING
REFRIGERATION

NOW...

you can economically control thermal expansion in heating system lines...



with the FLEXON EXPANSION COMPENSATOR

The problem of simply and economically absorbing expansion in heating system lines has now been solved. The Flexon Expansion Compensator is the answer. It consists of a two ply corrosion resistant bellows with copper tube end connections, enclosed in a floating protective brass shroud. Designed to handle motion up to ½", it is suitable for temperatures from −60° F. to 300° F., pressures up to 40 psig. Sizes are ¾", 1", 1¼" and 2". The 2" size has threaded fittings. Threaded fittings are also available on smaller sizes.

Before you go any further on that heating job, check the advantages of Flexon Expansion Compensators. You will find them the economical way to insure against leakage resulting from uncontrolled expansion and they will reduce pipe creeping noises, too. Contact your local distributor for further information or use the coupon below to get your copy of a descriptive bulletin.

For medium and high pressure piping —

FLEXON EXPANSION JOINTS

FREE FLEXING TYPE — Available in sizes from 3" through 48", I.D. in copper or stainless steel. Suitable for pressures from vacuum to 30 psi and temperatures from —20° F. to 850° F. Flanges or welding ends.

CONTROLLED FLEXING TYPE — Available in sizes from 3" through 24", I.D. with copper or stainless steel pressure carrier and cast iron control rings. Suitable for pressures from vacuum to 300 psi and temperatures from —20° F. to 850° F. Flanges or welding ends.

SPECIAL TYPES — A variety of assemblies are available for special requirements including special very high pressure units for pressures to 5500 psi. For recommendations send an outline of your requirements.

DESIGN GUIDE — The Flexon Expansion Joint Design Guide is a 24 page handbook on the selection and application of expansion joints. Write for your free copy, today.

Flexonics Corporation

Flexon identifies products of Flexonics Corporation that have served industry for over 53 years.

EXPANSION JOINT DIVISION
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Maywood, Illinois

Flexonics Corporation
1391 S. Third Ave.
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Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

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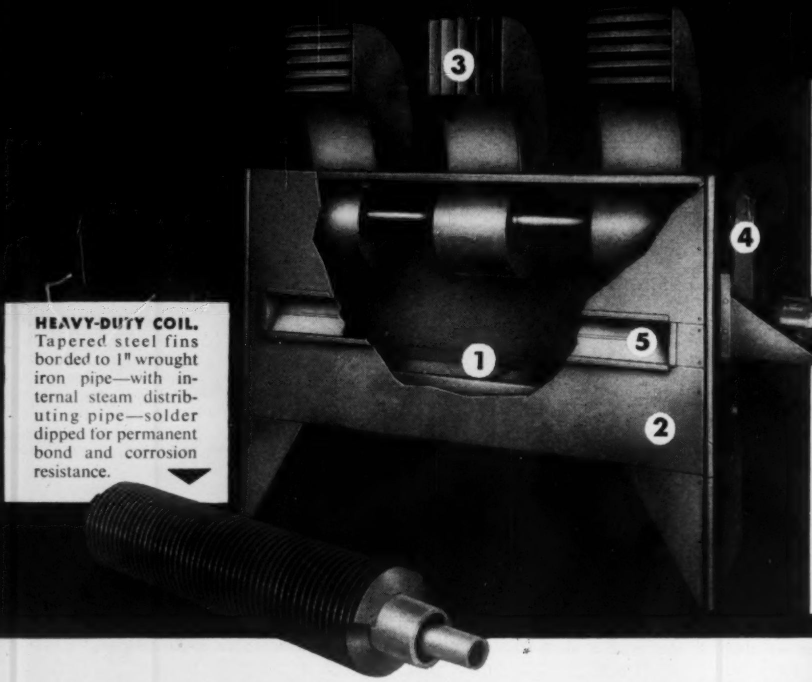
My Wholesaler is:..

Fact:

Rugged Westinghouse Industrial Heaters available in 24 Sizes . . . 8 Coil Selections . . . 150 Ratings from 100,000 to 2,500,000 BTU/hr . . . 2,000 to 25,000 CFM each



HEAVY-DUTY COIL. Tapered steel fins borded to 1" wrought iron pipe—with internal steam distributing pipe—solder dipped for permanent bond and corrosion resistance.

1. Proven, Westinghouse-manufactured, extended surface heating coils good for continuous operation up to 200 psig.

2. Die-formed casings with rounded corners eliminate accidents and dirt catching pockets. Front and back panels easily removable.

3. Multiple louvered outlets for efficient distribution of heated air.

4. Self-aligning, grease-lubricated ball bearings mounted outside casing, readily serviceable.

5. Face and by-pass dampers permit continuous air circulation to maintain uniform temperatures.

NOTE: Louver type mixing box accessory permits introduction of fresh air for make-up and ventilation, with or without filters.

Solve your space heating problems with Westinghouse-Sturtevant Industrial Heaters. Eliminate cold, drafty conditions caused by excessive cold infiltration through leakage or exhaust.

Two Types With Wide Applications:

GENERAL PURPOSE HEATER . . . For manufacturing areas, warehouses, garages, commercial buildings—with standard non-ferrous heating coils.

HEAVY-DUTY HEATER . . . For continuous-duty high-pressure systems, or industrial process work—with wrought iron heating coils.

The compact packaged engineering of every Westinghouse-Sturtevant Industrial Heater provides units for mounting on floor, walls, or suspended from ceilings. In short, they can be placed where they will do the most good, and can be relocated to meet any change in plant layout.

Every unit is backed with a Westinghouse exclusive—*one warranty*. Only Westinghouse makes all principal components—Fans, Heating Coils, and Motors. You can get unit engineering and single equipment responsibility.

MORE FACTS? To find out how to solve your particular heating problem, call your Westinghouse-Sturtevant Sales Engineer . . . he is the "Man With The Facts" on heating, air handling, and electronic air cleaning . . . or fill in coupon below.

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Please send more information on your Industrial Heaters.

NAME AND TITLE . . . .

COMPANY . . . .

CITY . . . . STATE . . . .

The UNARCO dual-vector* offers clean, hot water heat in winter ...cool dehumidified air in summer

The UNARCO DUAL-VECTOR is a *quality product newly designed* to make economically feasible the combination of a fine hot water heating system and a chilled water cooling system.

Now you can have all the advantages of hot water heat—cleanliness...smooth, even heat...quiet operation—and in summer, cool, conditioned air. DUAL-VECTORS are used in a series, one-pipe or two-pipe system, providing forced hot water heat *or* chilled water cooling *using the same system.*

What's more, the initial cost is often less than other combination systems which lack the acknowledged advantages of "wet" heat. And because each unit is individually controlled, you can heat or cool as few or as many rooms as desired. Thus the money saved in winter will help pay for your summer cooling comfort. Clip and send in coupon below for detailed information. *trade mark

UNARCO®

DUAL-VECTORS are ideal for homes, apartments, hotels, motels, offices and institutional buildings.

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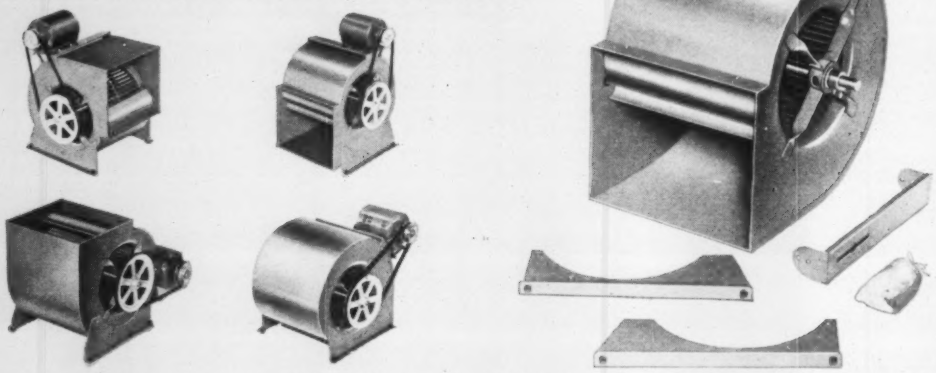
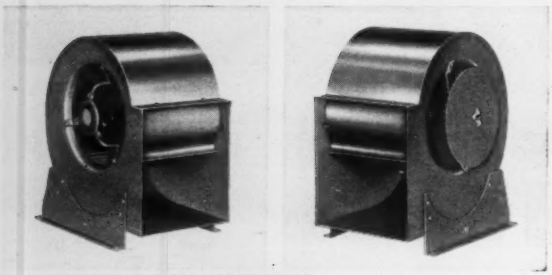
SOLVES 80% OF YOUR PRODUCTION REQUIREMENTS

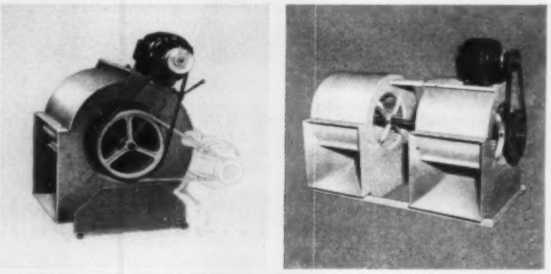


YOU CAN MEASURE THE VALUE IN ADDED PERFORMANCE AND DIRECT SAVINGS IN YOUR PLANT

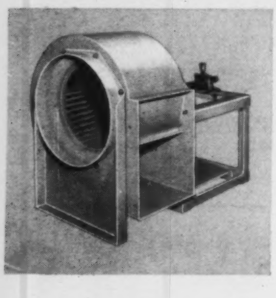
HERE IS PRODUCTION FLEXIBILITY such as you've never known before. Each Brundage Universal Blower mounts in 8 discharge angles. Each unit serves all requirements for its particular size. You lower inventories. Assembly techniques are simplified. And, changes in your production run require less down-time. You profit at every step where blowers are used . . . and Brundage quality compliments your finest product.



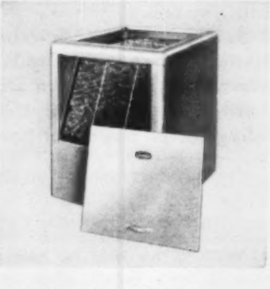
DIRECT DRIVE BLOWERS. Perfect for modern, compact heating and cooling equipment. Direct Drive Blowers provide maximum output in the smallest space . . . and cut costs by eliminating parts. *Exclusive Volume Control Damper* requires no electrical components . . . provides balanced delivery at lowest cost. Available in all standard discharges.



SERIES 'X' & SERIES 'T' BLOWERS. Twelve sizes to fit all domestic and many commercial heating and cooling applications . . . up to 5,000 CFM capacity per wheel. Single or multiple wheels available. Every wheel balanced before assembly. One-piece bridge motor mounts, self-aligning bearings. ("Life-time" lubricated bearings optional).



BLOWER-EXHAUSTERS. For industrial and commercial ventilation, fume, and smoke removal. Readily adapted to induced-draft systems . . . indoor and outdoor applications. Single-width, single-inlet design maintains higher static pressure, affords faster air removal, quiet operation.



BLOWER-FILTER PACKAGE UNITS.

Stocked in 7 sizes for furnaces ranging from 40,000 to 225,000 BTU output. Air handling capacities to 3,200 CFM at 3/8" static. Door provides access to blower and filters. Belt or direct drive models. Motor has over-load protection.

Phone Kalamazoo 2-0251 for test samples and complete technical data. Your own evaluation will prove Brundage quality and performance.

Blower specialists since 1919

THE BRUNDAGE COMPANY

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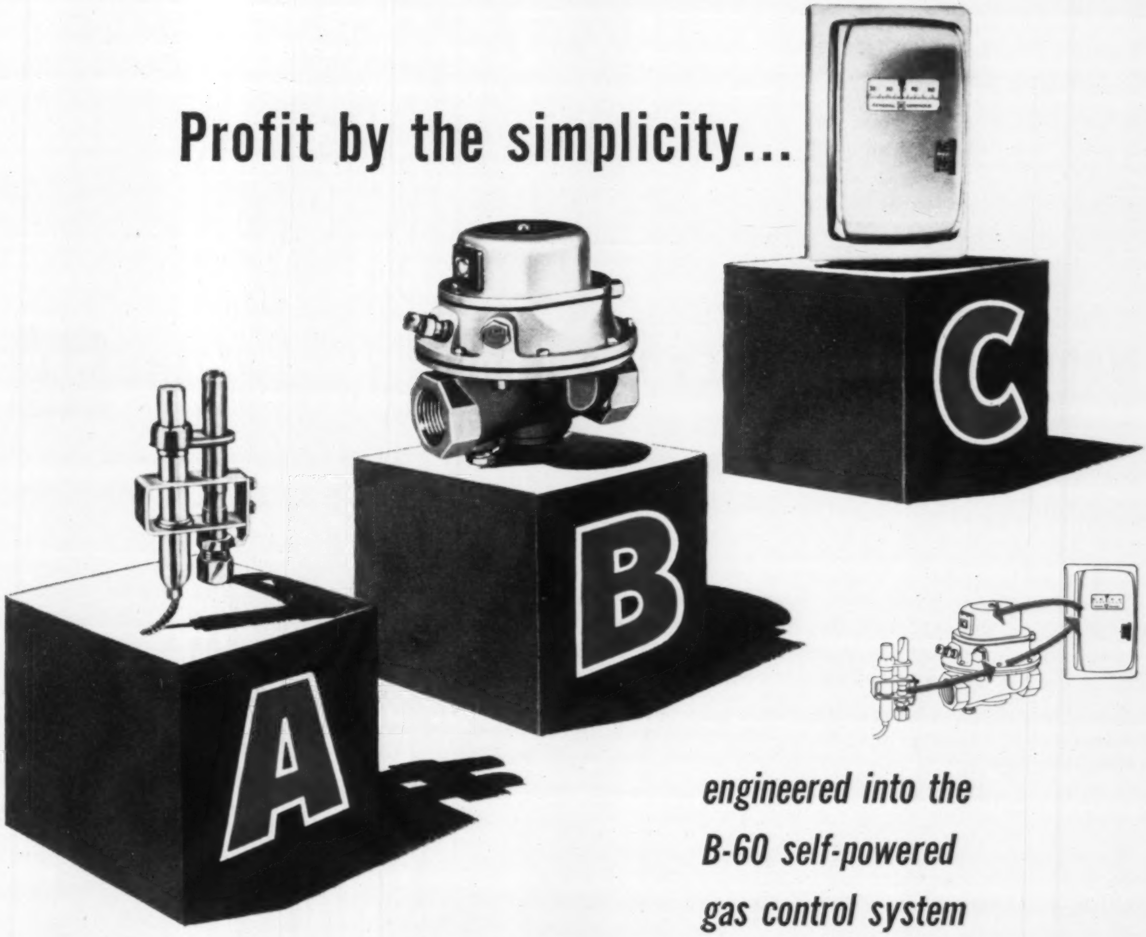

engineered into the B-60 self-powered gas control system

General Controls
B-60
Package Set

Economy . . . safety . . . long life . . . trouble-free service . . . these are some of the values engineered into General Controls' simplified B-60 all-gas control system. The pilot generator produces electric current and provides safety shutoff in case of pilot flame outage. The diaphragm gas valve opens and closes the fuel line, operating entirely on current supplied by the pilot generator. The room thermostat activates the gas valve, maintaining selected room temperatures. Simple to install, the B-60 system was the *original* self-powered all-gas control system. It is still first in the field today!

GENERAL CONTROLS

Glendale, California • Burbank, California • Skokie, Illinois

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls for Heating, Home Appliances, Refrigeration, Industrial and Aircraft Applications.

FACTORY BRANCHES IN 38 PRINCIPAL CITIES

See your classified telephone directory.

WOOD WON'T ROT WHEN IT'S COLD AND DRY

Living fungi, which break down the substance of wood are microscopic and abundant. But they need WARMTH and DAMPNESS to develop. Dampness will also peel off paint, crumble plaster, cause iron and steel to rust.

Some insulations can promote and retain destructive condensation inside walls and other structural spaces. Warmth and vapor can flow through asphalt, paper, plaster and most building materials, including ordinary insulations. Vapor condenses when, upon striking a colder surface, the air reaches a dew-point.

An empty space, the best insulator against heat flow by Conduction, does not prevent heat flow by Radiation and Convection. Of all heat transferred through structural spaces, about 50% to 80% is by Radiation; all but about 7% of the rest is Convection. The surfaces of multiple accordion aluminum sheets have a reflectivity for heat rays of 97%; absorptivity and emissivity of only 3%. The aluminum and fiber layers retard Convection. Conduction is slight through the preponderant low density air spaces.

The tough aluminum sheets in multiple accordion aluminum are almost completely impervious to water vapor, and are long and continuous. Infiltration under flat, stapled flanges is slight.

Where multiple accordion aluminum is used, fortuitous vapor and water (for instance rain) which intrude into wall and similar spaces will gradually flow out as vapor through exterior walls and roofs as pressure develops within, because vapor flows from areas of greater to less density. The vapor cannot back up through the continuous, almost completely impervious aluminum, so it flows out because exterior walls and roofs have substantial permeability in comparison to aluminum, far greater than the required 5 to 1 ratio.

To obtain maximum uniform depth protection against heat loss and condensation formation, it is necessary to use **edge-to-edge** multiple aluminum, **each** sheet of which automatically stretches from joist to joist, and also all through the flanges for further vapor protection as well as permanent attachment of each sheet.

The U.S. NATIONAL BUREAU OF STANDARDS brochure: "Moisture Condensation in Building Walls," discusses vapor and heat flow, and the causes and prevention of condensation. Use the coupon. Get a copy at our expense.

COST OF EDGE-TO-EDGE
MULTIPLE ALUMINUM INFRA INSULATION
installed in new construction between
wood joists, material with labor

Type 6-S under 9½¢ sq. ft.

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INFFRA INSULATION, INC., 525 Bway., New York, N. Y.

THE EDITORS' PAGES

• *IT ISN'T A MAN'S MISTAKES that make him a failure — it's his refusal to take any more chances on making a mistake again. Employees should be encouraged to make decisions without anxiety. That can only be done if supervisors permit employees to make decisions on the job whenever possible. Errors or mistakes in judgment should not be condoned or ignored; they should be used to point the way to develop better judgment for the future.*

Air Conditioning Production, Sales To Increase

. . . market research shows

1955 WILL BE an excellent year for commercial and industrial air conditioning, reports G. K. Iwashita, general manager, Commercial and Industrial Air Conditioning department, General Electric Co. Market research, he says, indicates that production and sales of packaged air conditioners alone will increase about 15 percent. His department expects to exceed the industry rate of increase in volume substantially, as evidenced by its plans to double its productive capacity and reduce costs.

1955 Construction Booms With Strong Start

. . . December awards confirm

AN UNPRECEDENTED burst of strength in construction activity is certain in the weeks ahead, according to the F. W. Dodge Corp. December 1954 awards, totalling $1,828,837,000, ran 41 percent ahead of December 1953, and brought 1954 awards to a record high of $19.77 billion, 13 percent above the previous record set in 1953.

"The high December total will be hailed as the first solid assurance to confirm the optimistic views that have been expressed as to business in 1955," commented Thomas S. Holden, Dodge vice chairman.

All three categories for construction in the 37 states east of the Rockies showed gains over the previous month and over December 1953. For December the totals were: non-residential, $701,427,000, up 43 percent over November and 30 percent over December 1953; residential, $761,577,000 up 7 percent over November and up 76 percent over December 1953; public works and utilities, $365,833,000, up 22 percent over November and up 13 percent over December 1953.

For 1954 the totals were: nonresidential, $7,110,348,000, up 2 percent over 1953; residential, $8,518,291,000 up 31 percent; public works and utilities, $4,141,568,000, up 3 percent. The grand total was up 13 percent.

Commercial and Industrial Air Conditioning To Rise

. . . intense competition seen

IN ADDITION to the continuing increase of air conditioning installations in new and existing homes and offices, a significant increase in industrial plant air conditioning is expected in 1955, according to Cloud Wampler, president of Carrier Corp.

"For every person working in a business office there are more than two working in a factory whose alertness and competent effort are equally important. We, therefore, expect comfort air conditioning of industrial plants to begin in 1955 to show its truly great potential, which long range seems second only to that for homes," he said.

"The high rate of construction of office buildings has brought with it a correspondingly large volume of central station air conditioning, since virtually all of these structures incorporate year 'round comfort as a basic element.

"And as a result of the competition of modern new office space, older buildings are now being air conditioned at a rapid pace. In fact, Carrier's records for 1954 show that the dollar volume for existing office building contracts was more than double that for new structures, lifting this to the largest single category of new business in the field of 'big' air conditioning," he reported.

Total 1954 industry volume at retail was about $2 billion, an increase of 14 percent over the previous year.

New Specifications Issued For Welding Electrodes

. . . also for welded steel pipe

FOR THE FIRST TIME, industry-wide specifications have been agreed upon for nickel and nickel base alloy covered welding electrodes. These new tentative specifications, issued jointly by the American Society for Testing Materials and the American Welding Society — ASTM designation B 295; AWS designation A5.11 — cover electrodes for welding nickel and nickel base alloys individually to themselves and also for welding these materials to steel. Also included are filler metals for welding the clad side of nickel base alloy clad steels.

Twelve classifications of filler metal are established by these specifications including all the commonly used materials. The chemical analysis of the different classifications, standard sizes and lengths, packaging requirements and standard tests for verifying conformity of a given filler metal to the standard requirements are also provided.

Copies of the specifications can be obtained at 25 cents each from the American Welding Society, 33 West 39th St., New York 18, or the American Society for Testing Materials, 1916 Race St., Philadelphia 3.

Also issued by the ASTM is a new tentative specification for welded steel pipe.

In response to a request from American Standards Association Sectional Committee B31, tentative specifications for metal arc welded steel pipe for high pressure transmission service (A 381) were developed to fill a definite need. They cover straight seam double submerged arc welded steel pipe 16 in. and larger in outside diameter, with wall thicknesses from 5/16 to 1½ in. inclusive. The pipe is intended for carrying liquid, gas or vapor, and is suitable for bending, flanging, corrugating and similar operations. The sectional committee hopes to refer to these specifications in the next revision of the Code for Pressure Piping.

Several other steel specifications were revised.

Los Angeles Sewers Force Water Conservation

. . . in air conditioning

REGULATIONS calling for the use of water conserving devices for air conditioning equipment have been adopted in many cities to alleviate the water shortage problem, but in Los Angeles a similar measure has been designed to prevent overloading the city's inadequate sewer system. The Bureau of Sanitation is now strictly enforcing these municipal code provisions by requiring that the users of any unit or system which employs water as a cooling medium must install, maintain, and use a water conserving device, if they desire to connect the unit or system to the sanitary sewer system.

On August 16, 1954, the Board of Public Works forbade the discharge of waters which are "odorless, stable, and free from deleterious chemicals" into any sewer. Under this policy, "any and all cooling waters from any hotel, apartment, commercial, institutional, industrial, manufacturing, processing or service establishment must be disposed of by some alternate means."

Alternate methods include:

1) Utilization of air cooled units in lieu of water cooled units, where practicable.

2) Discharge into a storm drain or channel, where such may be available, under a permit issued by the Bureau of Sanitation.

3) Discharge to a cesspool, seepage well, or leaching system within the premises, under permit from the Health Department and Department of Building and Safety.

4) Utilize a cooling tower, evaporative condenser, or other recirculating device whereby only a small bleedoff or blowdown — not to exceed 2 percent of the circulating rate, corrected to an intake-output differential of 10 F — may be discharged into the sanitary sewer, under a permit issued by the Bureau of Sanitation.

In a little less than one year, 1,967,167 gal per day of clear water has been diverted out of the sanitary sewer in the San Fernando Valley section of the city alone, it is reported. The diversion throughout the city is now estimated to be 3 million gal per day.

Air Conditioning Booms In South America

. . . expanding rapidly

AIR CONDITIONING of commercial and industrial establishments is developing at a faster rate in South America than in any other tropical region in the world, according to P. C. Sharp, assistant manager of the International Division of Minneapolis-Honeywell Regulator Co.

"U. S. firms with investment interests in South America are setting the pace in the introduction of North American comfort standards to approximately 85 percent of the continent in which year 'round cooling is required," Mr. Sharp said. Most South American firms are also including central cooling in office buildings, hotels and other commercial establishments now being built.

At this time, he added, 90 percent of the cooling equipment installed in tropical South America is of U. S. design and manufacture. The rest comes from Europe.

World's Longest Electrically Heated Pipe Line in Alaska

. . . supplies water to mine

THE WORLD'S LONGEST electrically heated pipe line is a 6 in. water supply line at a tin mine north of Nome, Alaska, according to the rubber chemicals division of E. I. du Pont de Nemours & Co. The pipe is 9000 ft long. It is installed in a 2 ft square wooden box packed with mineral wool and heated by 54,000 ft of cable. Each heating element is 4500 ft long and operates at 440 v. Water temperature at its source is 32.7 F, and the outside temperature drops as low as −80 F. The mine can now operate 24 hours a day the year around. Before, it could operate only two and a half to three months in the summer.

Dr. Max Jakob Passes Away

. . . heat transfer authority

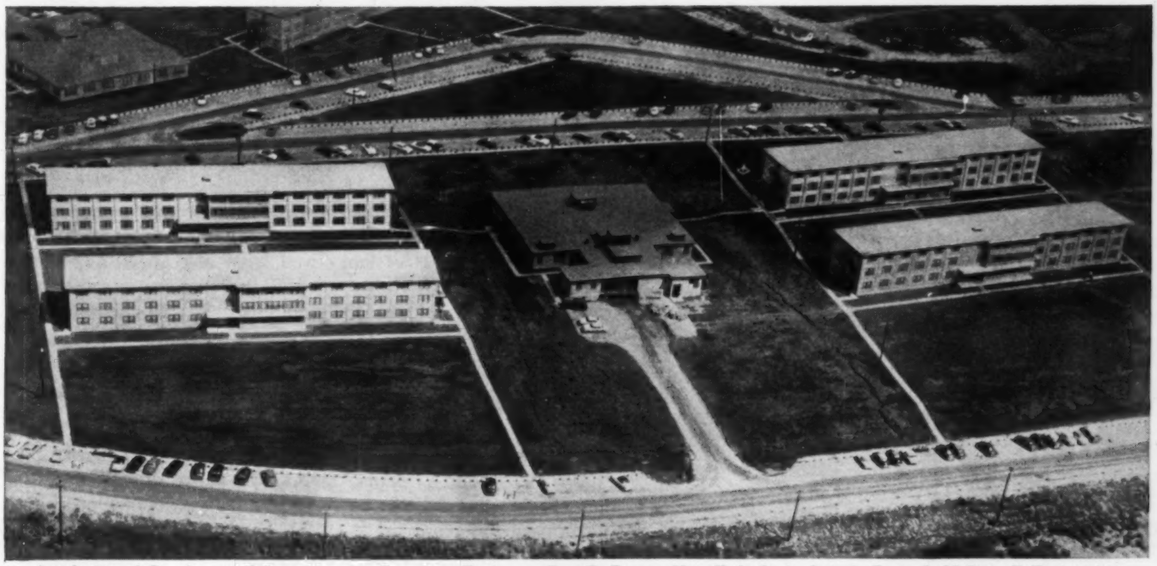
DR. MAX JAKOB, 75, a leading authority on heat transfer and thermodynamics, passed away last month.

He came to the U. S. in 1936 from Germany. Since 1937 he had been research professor of mechanical engineering at Illinois Institute of Technology and consultant in heat transfer research at Armour Research Foundation.

Shortly before his death, Dr. Jakob completed the manuscript for the second volume of the textbook, "Heat Transfer," the first volume of which was published in 1949. He was the author of many books and more than 300 scientific papers. He also had edited several technical magazines. One of his most extensive works is "Der Chemie-Ingenieur," an eight volume text on chemical engineering which he co-authored before 1935.

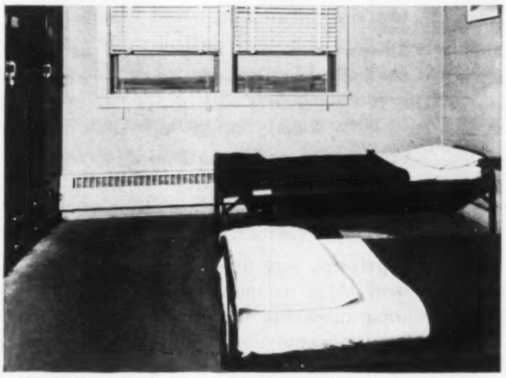
"Quote"

"Air conditioning, for which we have just finished a large new plant, should witness a sales increase of 1000 percent in the next 10 years." — Gwilym A. Price, president, Westinghouse Electric Corp., in a year-end statement for 1954.



Aerial view of Grandview AF Base, Missouri. Consulting Engineers: Guy B. Panero, New York (basic design); Burns & McDonnell Engineering Co., Kansas City (GAFB modifications). Heating Contractor: ELUS Corp., Kansas City. General Contractor: Chambers-Tarbell, Kansas City.

2½ MILES OF HEATING COMFORT for Grandview AF Base...



Typical dormitory room with Webster Tru-Perimeter Heating with Webster Walvector along exposed walls.

Modern airmen's dormitories with forced hot water Webster Tru-Perimeter Heating provide more space, more privacy, more comfort — all objectives of the U.S. Air Force when they built ten new dormitories at Grandview, Missouri.

For heating comfort, nearly 2½ miles of Webster Walvector circle the exposed walls . . . create a blanket of clean, gentle, even warmth . . . end cold spots, hot spots and drafts. Heating element and piping are concealed in trim metal enclosures.

New, modern housing has been recognized as essential in maintaining efficiency of career airmen. At Grandview, Webster Tru-Perimeter Heating contributes to airmen's comfort.

For details on Webster Tru-Perimeter Heating for steam or forced hot water, write us.

Address Dept. HP-2

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Camden 5, N. J. :: Representatives in Principal U. S. Cities
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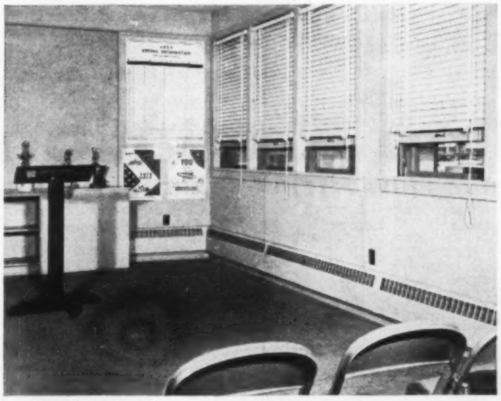
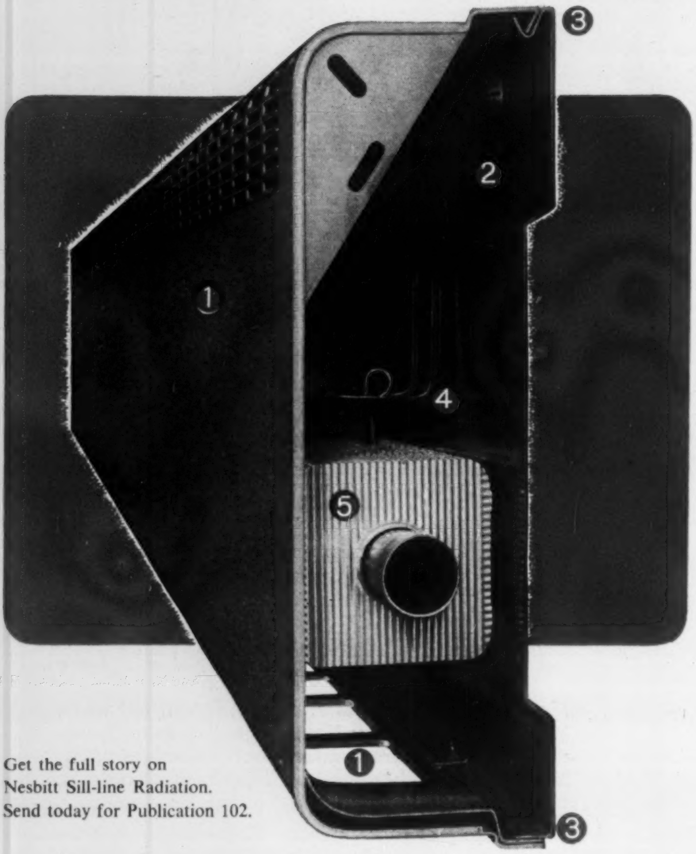


Lounge-day room fitted for use as lecture room. Note Walvector beneath window area.

Webster
WALVECTOR
REG. U. S. PAT. OFF.
For Steam or Hot Water Heating

AND **Webster also makes Baseboard and Convector Radiation; heating and process steam specialties; Moderator Controls for Steam Heating and controls for hot water heating; and Unit Heaters. Data on request.**

Newer than new... Sill-line for '55



Get the full story on
Nesbitt Sill-line Radiation.
Send today for Publication 102.

FEATURING—

1. Re-styled front panel with attractive curved louvre grille and extruded bottom inlet looks well from any angle, any height. Above eye-level installations do not require inverted mounting or special enclosures.

2. One piece back panel, formed of 20-gage steel for maximum strength and rigidity, is prepunched for simplified installation without additional wall attachments.

3. Top and bottom interlocks of back panel support front panel for entire length of the ensemble. Permanent alignment assured.

4. Adjustable hanger brackets support heating element, provide for vertical adjustment for pitch and longitudinal movement for expansion and contraction.

5. Corrugated aluminum fins are damage resistant, easier to handle and install. Sized-to-mate tube ends permit quick end-to-end sweat jointing without couplings.

Seven standard lengths of casing and heating element combine to any room length—without cutting on the site—through use of telescoping, overlapping sleeves.

Full range of sizes, 2′ to 8′, in four cabinet types. Capacities from 2.9 to 11.1 sq. ft. EDR. Complete accessories to meet all practical installation needs. (See below.)

Optional equipment include knob-operated blade dampers, Nesbitt steam-distributing tubes for uniform heating with modulating control, and off-set adapters for convenient and economical steam trap connections.

Separate packaging of enclosures, heating elements and accessories facilitates selection, distribution and handling; offers the maximum protection from damage.

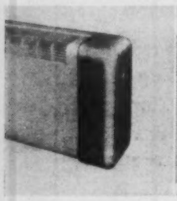
When Nesbitt Sill-line Radiation was brand new—a few years ago—it startled the industry by its functional ingenuity, imaginative artistry, and recordbreaking ease of installation . . . but as Nesbitts continuing engineering has found ways of further increasing these advantages to you, the contractor, these later improvements have been incorporated for 1955.

Today's Nesbitt Sill-line is the most advanced form of perimeter radiation—applicable with the greatest known ease and economy—evidence of a dynamic manufacturing policy.

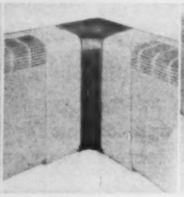
Nesbitt Sill-line Radiation

MANUFACTURED AND SOLD BY JOHN J. NESBITT, INC., PHILADELPHIA 36, PENNSYLVANIA

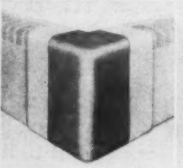
End Caps



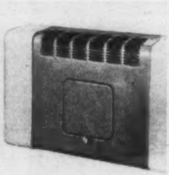
90° Inside Corner



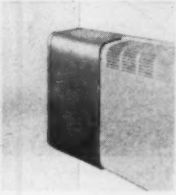
90° Outside Corner



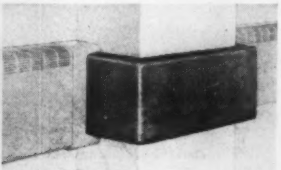
Valve Compartment



Sleeves



Column Enclosure



"OPEN FOR DISCUSSION"

• *WE FOLLOW HERE each month the practice at engineering society meetings of providing an "open for discussion" period. You are urged to take part. Just address your comments to the Editors. Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

"High Pressure Systems Are Not Necessarily High Velocity"

THE TITLE of T. L. Day's comments, *Why Not Discuss High Pressure Air Systems?*, in the December 1954 HPAC, on C. Milton Wilson's *Handbook on High Velocity Air Distribution Design*, in the November 1954 HPAC, has a logical connotation but does not refer directly to Mr. Wilson's article.

Mr. Wilson's article is on the subject of high velocity systems, and he points out that one main benefit of this type of system — economy of space — is obtained by using high velocity air distribution. In such systems, the higher pressures that go hand in hand with velocity are purposely kept as low as possible to achieve economy of fan horsepower. To speak of "high pressure" systems as "high velocity" systems, is not correct, in my opinion. They should be considered distinctly different. These high pressure systems may be designed for a very special purpose — extreme flexibility in volume control — but not for the reason of saving space.

Mr. Day correctly states that "the degree of unbalance is in direct relation to the ratio of duct resistance to outlet resistance." To illustrate the range of this ratio, he compares a low pressure system with a high pressure system with the same duct resistance for both systems. Without a change in temperature differential, however, this implies that the duct size and velocity remain identical for both types of systems. There would certainly be no "space saving" achieved under these conditions.

To achieve the flexibility stressed by Mr. Day would require excessive fan operating costs, with units having a resistance from 1.5 to 4.0 in. WG. For example, if the system were designed to allow the quantity of air to be doubled at any outlet, for the outlet resistances specified by Mr. Day, the system pressures would rise to 6 in. and possibly up to 16 in. WG, in addition to the nominal duct resistance.

Therefore, I do not believe that Mr. Day's figures, when applied to high velocity systems — where the duct static pressure may vary from about 2 to 3 in. WG for the diffusers nearest the fan, to the minimum for the diffusers at the end of the runs — will have the same significance as when applied to a system in which the total static pressure is raised to obtain flexibility. Reserve pressure is not available, to allow for errors or inaccuracies in duct design that may be found, because of the high outlet pressure resistances. The so-called reserve capacity will be greatest in the system with the lowest outlet resistance, for a given fan characteristic and power consumption.

WILLIAM WAELDNER

Senior Research Engineer,
Anemostat Corp. of America

"Use No Lighter Copper Tube than Type K for District Heating Renewal"

I WOULD LIKE to comment on the article, *Renewing Underground Piping*, by G. K. Saurwein, in the January HPAC.

For the replacement of gas services, type K copper tube is generally used, although type L, which is lighter, has been used in some cases. Even as light a weight as type M has been used. However, type M is a hard drawn tube available only in straight lengths of 20 ft, and a different procedure is necessary in joining the sections than is used with annealed tube in coils.

For the replacement of district steam services, no copper tube lighter than type K should be used.

ARTHUR I. HEIM

Research Engineer
Copper & Brass Research Association

"Simpler Control Arrangements Can Be Used on High Velocity Systems"

THE ARTICLE, *Handbook on High Velocity Air Distribution Design*, by C. Milton Wilson, in the November 1954 HPAC, was well written and will serve as a good reference for high velocity systems.

One section of the article, however, is devoted to a discussion of a control arrangement which, we have found through experience on low pressure systems, is often unstable. Its complicated nature is not usually warranted on the inherently easy to control high velocity systems. This arrangement utilizes a differential static pressure controller to reset duct air temperatures. The theory is that the closing of the warm air dampers by the room thermostats will increase the static pressure in that duct, thus indicating a general need for less heat. This increased static pressure, through the differential static pressure controller, decreases the duct air temperature, causing the warm air dampers to open, thereby reducing the static pressure in that duct.

Experience with many double duct systems has taught us that the main difficulties which are usually encountered when this particular control arrangement is put into operation are as follows.

One of the chief advantages of the double duct system is its flexibility because air at two different temperatures is available at all times. This permits more freedom in zoning a building and allows an interior room to be put on an exterior zone if it is warranted by a saving in ductwork, etc. If the duct air temperatures are adjusted from static pressure, and the average rooms controlled in this way can be satisfied, air at these duct air temperatures may not be able to satisfy conditions in the added space that it was economical to include in the zone.

It has been difficult to produce stable control for some such systems. This is because of the inability to match the response rates of the controller and controlled device. The differential pressure controller senses static pressure changes very rapidly. However, because of the inherent thermal lags in coils, etc., it takes time to change the temperature to correct for these pressure changes. Excessive cycling usually results.

One of the major reasons for installing static pressure control in a system is to eliminate the disturbing influence of one damper on the air flow through other dampers connected to the same duct. In the system suggested, the changing positions of mixing dampers cause the static pressure differential controller to change the duct air temperatures. This change in temperature requires other satisfied room thermostats to reposition their respective mixing dampers and compensate for the change in the heat content of the air feeding that space. This in turn affects the differential controller and usually results in additional cycling.

A further difficulty arises when attempting to readjust the cold duct air temperature because good humidity control requires that this temperature be maintained at, or near, the dew point temperature.

Experience has indicated that much simpler arrangements can be used on high velocity double duct systems, which permit the owner to utilize all of the advantages inherent in both the high velocity and the double duct systems. This system incorporates the use of volume control on the supply fans, with duct air temperatures being varied in accordance with outdoor conditions. The fan is controlled at a constant volume by use of inlet vanes and a pitot tube sensing station. Static pressure control on the individual duct is then utilized as a refinement. The air temperature in the hot duct is varied in accordance with the major factor responsible for load changes — the outdoor temperature. The cold duct air temperature is controlled at or near the desired dew point temperature. With this system, changes in load in one part of the system, which cause a re-positioning of mixing dampers and tend to change duct static pressures, are immediately compensated for by a stable static control system which prevents the control in other areas from being affected.

N. J. Janisse

Assistant Chief Field Engineer,
Johnson Service Co.

"I Need More Information on High Velocity Air Diffusers"

I have read the article, *Large High Velocity System Ventilates New Office Building*, by James H. Stiggleman, in the July 1954 HPAC, and have found it to be most interesting.

For some time, I have been looking for information on this subject, and this article has been of great help to me. I would like to know if there is additional information available on the design of high velocity distribution systems and where I may obtain it.

One of my problems is that diffusers for these systems are not manufactured in our country, and I would like to know whom I may consult about the use of diffusers for this type of system.

J. M. Gutierrez Burzaco

Heating and Air Conditioning Dept.
Iruma Sociedad de Responsabilidad, Ltd.
Buenos Aires, Argentina

The Author Replies — To my knowledge, the only published information on the subject of high pressure diffusers is available from the manufacturers of the diffusers. We have the advantage here in the U.S. of being able to contact these people at any time. I do not know how this obstacle can be overcome.

This is a relatively new field, and the various diffuser manufacturers are constantly revising and improving their products as a result of laboratory tests and experience with the various jobs in the field. Because of the relative infancy of this type of system, I have found that the published literature alone is not always of sufficient aid to design a job and that periodic discussions with the manufacturers' engineers are sometimes necessary. I have also found it to be helpful to make some test set-ups in a laboratory to determine if certain systems will work satisfactorily.

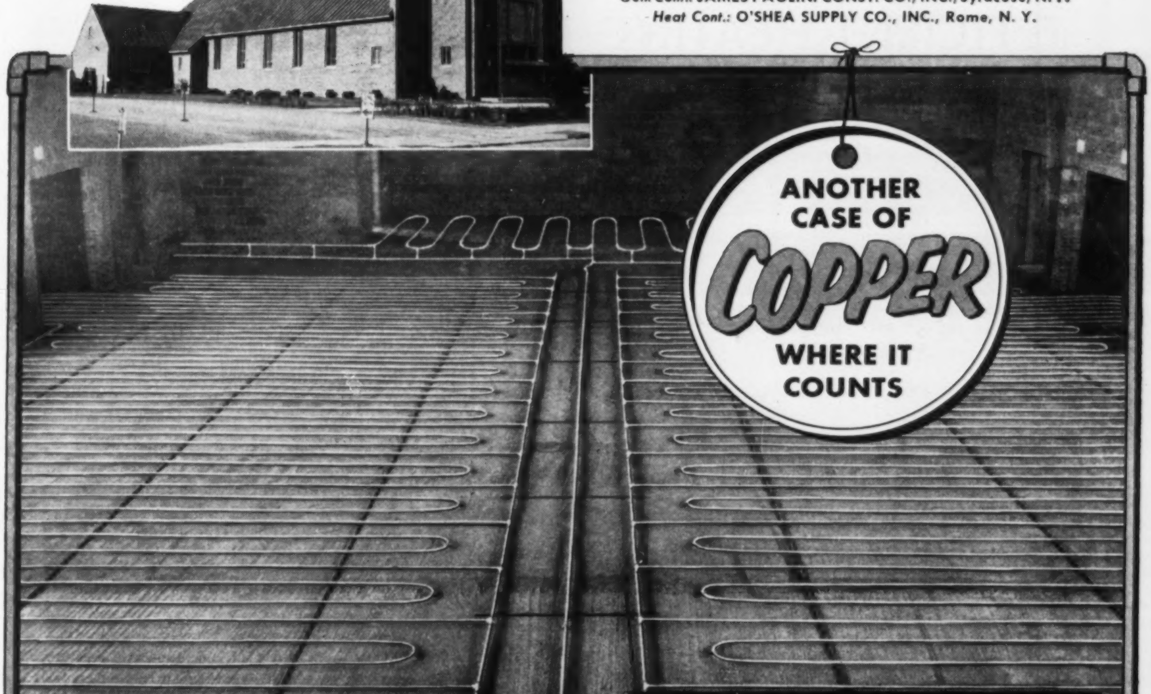
In general, the design of the system is identical with a conventional system, the main deviation being in the selection of equipment. When selecting diffusers, the main problem is usually not to exceed the maximum allowable static pressure for the diffuser that is the closest to the fan. Also, it is of course necessary to provide enough static pressure at the last diffuser to make it work. This will usually determine the total system static pressure which may be used in selecting the fan. Duct construction is another factor which must be given careful consideration, as I explained in my article.

James H. Stiggleman

Assistant Chief Mechanical Engineer
Childs and Smith, Architects and Engineers

St. John The Baptist Church
Rome, N. Y.

Architect: **FRANK W. BRODRICK, Syracuse, N. Y.**
Engineer: **MALCOLM B. MOYER, Syracuse, N. Y.**
Gen. Cont.: **JAMES PAOLINI CONST. CO., INC., Syracuse, N.Y.**
Heat Cont.: **O'SHEA SUPPLY CO., INC., Rome, N. Y.**



The beauty of heating a church by radiant panels is that traditional as well as modern architectural design may be used without having to make allowances for outlets or radiators in your design. It is the number one method of heating churches and similar permanent structures. And, when installation is completed panels are invisible. Also, when Revere Copper Water Tube is used it is easily and readily installed, easy to bend, requires no thread cutting and the solder or compression fittings used are readily made. There are fewer of these fittings and they are tight, trouble-free fittings when finished.

A radiant panel heating system of Revere Copper Tube is a long-lasting one, too, which is mighty important in a permanent structure such as a church. For copper tube cannot rust, its endurance has been proved for centuries.

So never mind what the other fellow says . . . *you* keep out of trouble with copper. Use Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, processing lines, waste stack and vent lines. Your Revere Distributor has plenty of stock these days, in all the required sizes.

IN THE LARGE PHOTO ABOVE NOTE THE NEAT LAYOUT, the even, easily-bent lengths of Revere Copper Water Tube, the few number of fittings . . . only every 60' in the panels. 5,000 ft. of tube was used in sizes ranging from ¾" to 1½". The architect and contractor tell us that the suggestions made by one of Revere's Technical Advisors were most helpful in both the planning and installation stages. Why don't you take advantage of this service? No obligation, naturally.

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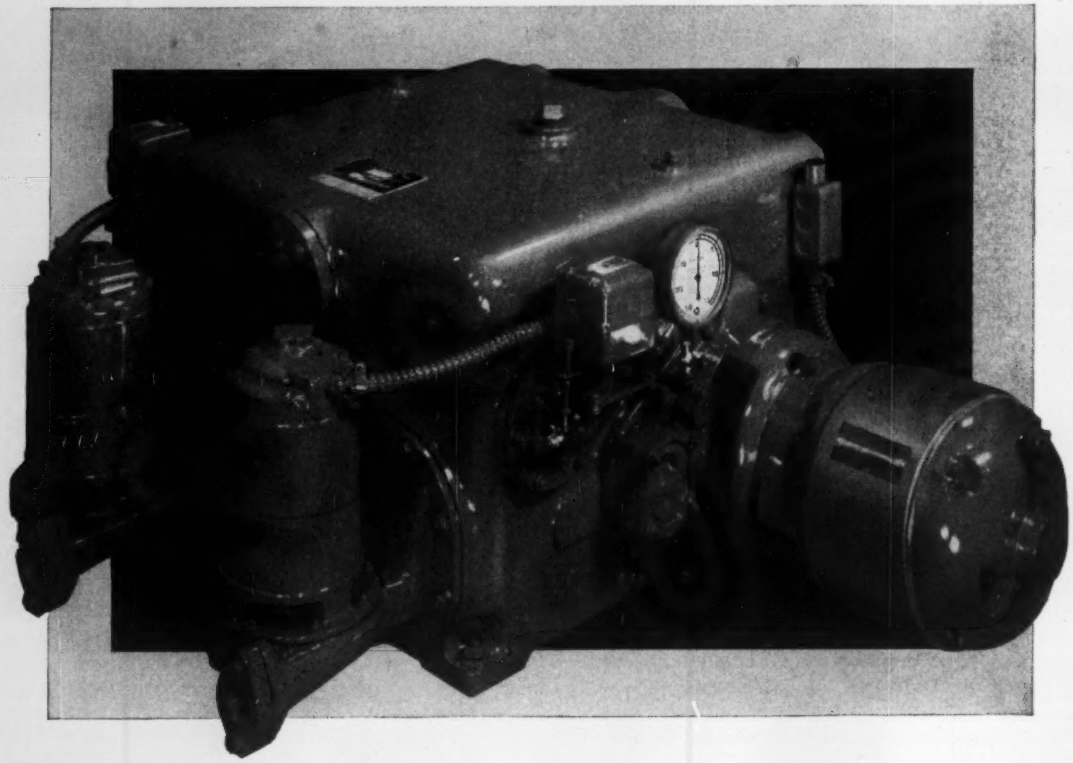
THIS NEW VACUUM HEATING PUMP

HAS THE INCREASED AIR CAPACITY EFFICIENT HEATING PRACTICE DEMANDS



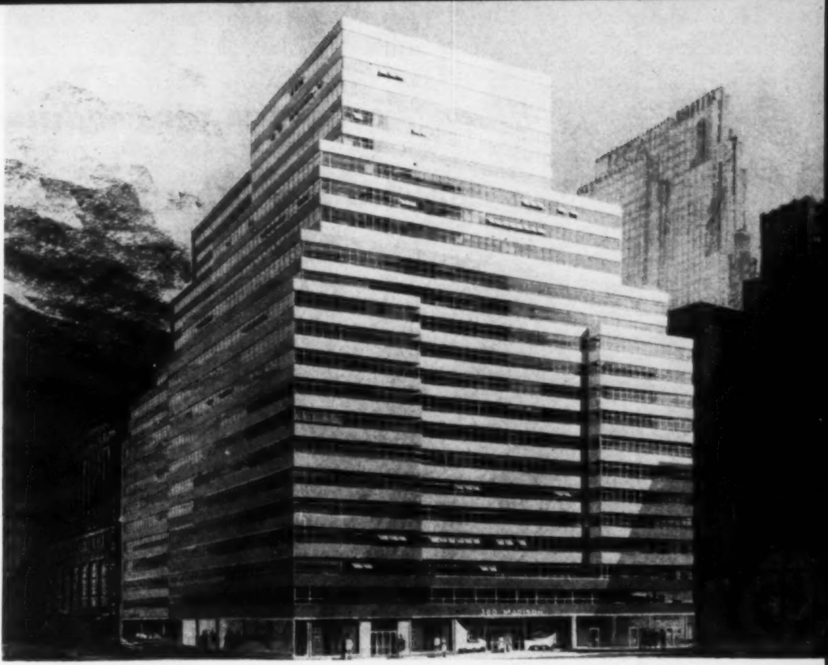
It's the Nash CSM

Designed and manufactured by the organization that made the Jennings Manifold Heating Pump standard of the Heating Industry, the new CSM incorporates every desirable feature architects, engineers, owners and operators have sought. Employing separate air and water pump elements, each with its own motor and each independently controlled by its own automatic switch, the capacities and arrangement may be widely varied to meet job conditions. For the first time, the engineer has the choice of realistic water and air capacities required for rapid system response without wasteful overheating.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

NASH ENGINEERING COMPANY
437 WILSON, SO. NORWALK, CONN.



NEW 26 story structure at 380 Madison Avenue is one of over 40 new office buildings erected in Manhattan since the war — all air conditioned

How Air Conditioning Makes Money

. . . for office buildings

By Lewis Smith
Heating Engineer

• Increased profit — not extra expense — results from air conditioning an office building today. More rentable area, higher rental rates, greater operating efficiencies, lower construction costs, and more flexible partition and lighting arrangements — all these and other benefits more than offset the cost of air conditioning.

WHEN A SKYSCRAPER office building in Denver is air conditioned one may well ask "How come?" Denver of all places, with its salubrious climate, "air conditioned by nature."

The answer to that question is complex. It isn't just a matter of making the tenants more comfortable. That is a factor, but there are other and vital reasons extending into the building design, construction and operation. In fact, air conditioning, once considered — at least in the North — a luxury, now has such economic advantages that hardly an office building anywhere in the U.S. can profitably be put up without it. This is especially true when it can be shown that in most cases air conditioning not only adds less to the cost of construction than is commonly supposed but can actually result in a cost reduction.

When the benefits aside from cooling are examined, they are found to be mainly economic and financial rather than having to do with human comfort. Let's examine these factors.

Ventilate Interior Spaces

Suppose we start at the ground level. Most city plots are oblong or square. It has been commonly accepted that no rentable space could be more than 25 ft from windows and, even so, space more than 15 ft in was not too desirable. This was primarily on account of ventilation, rather than light, and the impossibility of keeping the more remote spaces habitable, especially in summer. Where such interior spaces did exist, they could be rented only for storage, etc., at a very low price. Therefore, we had the slab type of building, or the use of many wings,

No longer a luxury, air conditioning is an integral part erected since the war. It is an economic necessity

with sometimes as little as 60 percent coverage of the land other than for stores on the ground floor, except for monumental types like the United Nations building and others in that category.

With air conditioning, a block type building can be put up to occupy 100 percent of the plot, at least up to the height where setbacks are required by local building codes. Interior spaces can be made just as comfortable as perimeter areas. Modern lighting makes up to a large extent for the lack of natural light. Offices which formerly had to hug the exterior walls can now extend into the interior, and occupancy of such spaces is at a rental far higher than before.

Illustrating this factor is 380 Madison Ave., New York City, erected on the site of the Ritz Carlton Hotel, by Uris Brothers, from a design by Emery Roth and Sons. This building has a frontage of 200 ft on Madison Ave., occupying the entire block from 46th to 47th St.

A building like this is rented to tenants who usually take a whole floor or even more, except for a few cases where fractional floors are used to accommodate smaller firms. The space is arranged for the tenant's requirements on a long term lease; and the entire floor is rent producing except for the service areas, although in some cases the toilets and the corridors at the elevators are included. Because of air conditioning, the interior spaces as shown in the photo below are used for clerical work and reception rooms, even though they have no outside exposure.

Increase Operating Efficiency

Another advantage is that a large tenant using more than one floor in the older buildings can be accommodated very often on a single floor in these new block type buildings. This makes his operation more efficient. This advantage can be stretched to apply with special force to a tenant requiring several floors.

Now all office buildings, except those put up by large companies for their own exclusive use, are in a sense speculative. That is to say, they are put up by people who expect to make a profit. Although in some cases this profit may accrue largely to the original promoters and builders out of the construction and resale, still the building finally has to pay its way. Obviously the cost of a block type building covering all the land doesn't go up in direct proportion to the floor area compared with the older non-air conditioned buildings; so, this gain in rentable area without proportional increase in cost goes a long way towards offsetting the extra cost of conditioning. Of course, the original owners of the land were not slow to recognize this fact and use it in setting the selling price of the plot.

Lower Ceilings Save Money

Next take the ceiling height. Before the advent of air conditioning, it was considered necessary to go up to about 11 ft for the sake of ventilation and for the reduction of heat at the occupancy level in summer time. With air conditioning, this height can be dropped to 8 or 9 ft. The only limit seems to be psychological; that is to say, claustrophobia. Although this reduction in height is not a clear gain of 2 or 3 ft, since air ducts take up a foot below the beams, it does mean a gain of perhaps one floor in ten. Since in most cities there are setback regulations, and in some cases height limitations, this gain is important. It, too, helps offset the cost of air conditioning equipment.

Another factor enters here. With hung ceilings lighting fixtures can be placed anywhere to suit the tenant needs rather than being set in regular patterns between floor beams.

TYPICAL RECEPTION ROOM shows possible use of interior space. Hung ceiling allows wide latitude for installation of lighting as well as for air conditioning

of practically every new office building for their profitable operation today.

Where a tenant takes a large space and wants it divided up for his own needs, this can be important.

Next take the walls. Glass is becoming cheaper than masonry and it puts less weight on the building frame and foundations. From the viewpoint of erection cost, all glass walls would be desirable, but without air conditioning they would be impossible. The heat gain from the sun would be too great in the summer, and even at times in the winter. The Mile High Center in Denver is a striking example of this. So here is another factor tending to reduce the erection cost through air conditioning. Unfortunately, the other side of this picture is that the greater the use of glass, the greater the operating cost due to the extra heat loss in winter and heat gain in the summer. Heat resistant glass, sun louvers, fins, sun screens and other shading devices have been developed which offer one answer to the problem.

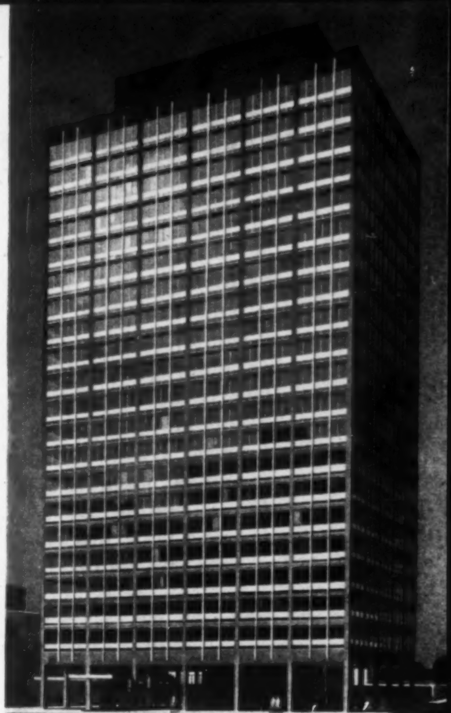
Meantime, a compromise is usually made by the use of continuous or "strip" windows running from column to column, with ordinary sill heights of about 30 in. and not necessarily extending to the ceiling. There is a resultant advantage here which again is not directly related to air conditioning. With these strip windows, office space can be partitioned better to suit each tenant, with due regard to the location of the heating and cooling units if placed in the exterior walls, whereas in the older buildings the window spacing controlled the partitioning.

Savings Offset Cost of A.C.

The picture isn't all in favor of air conditioning, however. Whatever system is used, the walls or columns, or both, have to be furred out quite a bit to accommodate the equipment. In the block type buildings, space must be used in the center of each floor for ventilating equipment. A cooling tower must be built and that takes up space and adds to the construction cost to support it. But taken as a whole, a good part of the 15 to 20 percent often figured as the added cost for air conditioning evaporates when all the savings are taken into account.

Just how much of this extra cost has been taken care of cannot be stated in an exact percentage because of the infinite variations in building design and construction, but it must be quite evident that there would be cases where the total cost of construction per square foot of rentable area is actually reduced by virtue of including air conditioning. Comparisons are almost impossible because one cannot take an air conditioned building and say what it would cost without it for the simple reason that such a building could not be erected unless air conditioned.

A simple but arbitrary calculation can be made that shows the extra cost of an air conditioning system. Take a fairly large building requiring 1000 tons of refrigeration. This may cost anywhere from $1000 to $1500 a ton installed, depending on the type of system, the building design, the climate and the extent to which automatic controls and zoning are used. Using a figure of $1200 and allowing 300 sq ft of rentable area per ton, with an 11 ft floor to floor height, this works out to $0.364 per cu ft. A heating system would have to be installed and hence is not chargeable as part of the extra cost of air conditioning. This might cost about $0.06 per cu ft on the assumption that there would be 100 cu ft per sq ft of radiation and that the system installed would cost $6.00 per sq ft of radiation. The net extra for air conditioning alone would be $0.304. A figure often used for the completed cost, including tenant changes, etc. of such a building is $1.80 per cu ft, including the air conditioning. Deducting the $0.304 gives the cost of the building not air conditioned as $1.496, so $0.304 makes an increase of 20.3 percent. However, that figure is subject to wide variations.



SYMBOL OF the progress in air conditioning office buildings is the new Mile High Center in Denver

Many office buildings with a fairly small floor area would not receive all the benefits of air conditioning which have been enumerated, so there would be a direct and substantial increase in construction cost which might run 15 or 20 percent and even more. The smaller the building, the higher this percentage of increase becomes. In view of the wide popularity of air conditioning today, it would be very difficult to put up a new office building in any city in the U.S. without this feature and fill it with tenants at the higher rental necessary to pay for the increased owning and operating costs, unless there happened to be locally a shortage of office space. Anyway, such a building would be obsolete before it was begun. Therefore, the builder of even a small office building is practically compelled to include air conditioning.

Another article on this subject by the author will be published in an early issue of HPAC.

How Widely Is Plastic Pipe Used?

• What's the picture of plastic pipe and tubing in the heating, piping and air conditioning industry as of today? Here is an overall survey, touching on their general characteristics, typical applications, and a word about the research that is making various plastic materials suitable for pipe and tubing.

WHILE PLASTIC pipe and tubing were made during World War II and to some extent before, their real development, production and use has taken place in the last nine years, according to The Society of the Plastics Industry, Inc.

Produced mainly by the extrusion process, plastic pipe and tubing offer numerous advantages. They resist corrosion; many types are resistant to chemical attack, electrolytic action and other factors. They are especially resistant to sulfurous shale, lime deposits, and algae formations. The friction loss in plastic pipe is low because of the low roughness factor. It is light in weight and, in some cases, it is flexible as well.

Applications Cited

Another advantage of plastic pipe and tubing is the variety of colors which are available. This is of value in plant operation and maintenance. In addition to color, plastic pipe and tubing can be clear or translucent. This feature makes blockages and stoppages easy to locate.

Plastic pipe fittings are available, and joining is easily and quickly accomplished. Pipe and tubing are often in cramped, congested and small areas around the tops of walls, under ceilings, under floors, in basements and in narrow trenches. The ease and speed of joining flexible plastic pipe with strong adhesives, flanges or threads simplifies the installation of replacement piping.

Plastic pipe is now being used in a variety of industrial plants, such as those in the automotive, aviation, chemical, petroleum and plastic fields for the transportation of liquids and gases. In the main, the liquids transmitted through plastic pipe and tubing are chemicals, oils, water, beverages, sewage and mine drainage. They are also used for the transmission of natural gas.

What Materials Are Used?

Various types of raw materials are used for making plastic pipe. These are polyethylene, styrene alloy, cellulose acetate, cellulose acetate butyrate, polyvinyl chloride, nylon, saran and fluorothene.

Also, there is a product called reinforced plastic pipe, which consists of certain plastic resins reinforced by a foreign agent. The plastic resins most used in reinforced pipe are called epoxy and polyester. However, there are others used also, such as alkyds, phenolics and polystyrene. The reinforcing material used in most cases is fibers of glass, but other materials may be used, such as paper, cotton and various fibers woven and unwoven.

The characteristics and physical properties of the different types of plastic raw materials offer different advantages in the form of pipe and tubing. Of course, it is necessary to determine the requirements for the particular application of pipe or tubing before selecting the type of plastic pipe to install.

Plastic pipe made of some raw materials will withstand broader temperature ranges than others. Some are tougher than others, and the amount of elasticity in some plastic pipe is greater than others. Of course, the same applies to fittings.

The various raw materials are furnished mainly by chemical, petroleum and rubber companies. Their customers purchase the raw material and produce it in the finished form. The companies which manufacture plastic pipe represent both the plastics industry and the metal industry. During the last two or three years, a number of metal companies have entered the plastics field either by setting up their own plastic pipe divisions or by acquiring a plastics company that has been producing pipe.

Research Projects Continue

A current research project on plastic pipe is now entering its second year. This project is at the Battelle Memorial Institute and is being sponsored by the plastic pipe manufacturers through The Society of the Plastics Industry, Inc. to establish methods for the evaluation of plastic pipe. This program will develop effective test methods on such factors as bursting strengths, safe working pressures, long range serviceability of plastic pipe under static pressure and dynamic loading.

Developing test methods is but one step in the program of pipe manufacturers to assure a quality product. These companies have been working for several years on the development of size and performance standards which, when completed, will be issued through the Commodity Standards Division of the U. S. Department of Commerce as a voluntary industry standard. The first of these dimensional standards to be approved was officially established on October 15, 1954 for flexible polyethylene pipe, and it covers outside and inside diameters, wall thicknesses, tolerances and weights per 100 ft.

In 1948, U.S. sales of plastic pipe were about \$½ million. In 1952, the value of plastic pipe sold was approximately \$15 million. The 1953 sales exceeded \$20 million, and the 1954 volume approached \$25 million.

What Atomic Energy Means

By John R. Dunning

Dean, School of Engineering,
Columbia University

• Because of the significance of atomic fuel and its future effect on heating, piping and air conditioning, as on other industries, HPAC presents here excerpts from Dr. Dunning's speech at the 59th annual Congress of American Industry.

ENERGY is the key to our whole modern civilization. Engineers, scientists, and industrialists primarily work with raw materials that are taken out of the ground. We process them, refine them, and turn them into the products we would like to use. All this is made possible through the use of energy. The thing that distinguishes this civilization in the U. S. from abroad is that most of the raw materials and all the energy that we're using today were here right at the start; and through the use of our knowledge we are putting all these materials to work.

There's nothing new about atomic energy. It's simply that our previous ways of utilizing energy have been based on secondary, degraded forms of energy from the sun, and what we're really searching for now and going after is the primary sources of energy, instead of fooling around with the secondary forms. This is the age we're stepping off into.

Era of Primary Energy

It's far from being a visionary period, as many of our conservative friends were maintaining five and 10 years ago, saying that there isn't even enough uranium in the world to make an atomic power economy. The wide searches for uranium have been so successful that our uranium and thorium reserves represent at least 25 times as much energy reserves as our coal and oil and water power.

The only way the U. S., or the world as a whole, can move forward during the next 10, 20, and 50 years is on the basis of gradually increasing the amounts of energy utilized through the atomic process. It is utterly impossible for our present other energy sources to meet the world's energy requirements 50 years from now in the year 2005.

What can this mean? Well, no one is saying that we'll have Utopia as a result of uranium. The largest single block of use is almost inevitably the development of power and, in fact, heat power, for whenever the splitting of uranium atoms occurs, a thickness of even a piece of paper intercepting the fission fragments converts most of the energy into heat. So we have the problem of utilizing heat energy right from the start. In most cases, its application starts from there and goes through the whole variety of heat uses.

Heat Energy Utilization

Already, the atomic submarine has gone down the ways, using this uranium 235 in enriched form as a fuel. And the various Mark 2's and 3's and 4's of submarine power plants are being developed. Ship propulsion engineers and architects are now reversing their opinion to the point of saying that there's no real reason why, 10 years from now, most major ships that go down the ways should not be atomic powered. Similarly, the airplane field was at first considered visionary by almost all scientists and engineers, but a few hardy souls pioneered in this and it is now generally agreed to be technically feasible, in spite of the fact that a nuclear reactor has to have a pretty heavy shield around it to protect people. The U. S. has moved ahead on its airplane application program, and the British are now moving ahead into the field as well.

Of course, atomic power normally won't be applied to small machines — such as small planes or automobiles, at least from our present knowledge — but it will mean a very real asset for very large transports. Atom powered locomotives were first thought impractical, but now many people believe it's thoroughly practical in the course of the next decade to see atomic propelled locomotives.

But in the end, it's in terms of the electrical power generation that probably the major use of atomic energy will find its way.

Actually, of course, the whole situation is very complicated. We have highly complex technical problems in getting the heat out, producing the energy and in terms of the chemical processing and cycling purified fuel. And so this field, whose basic principles are already quite clear, nevertheless has tremendous engineering and technical problems to be solved before the capital investments involved, the maintenance and operating expenses, are brought to the level that will make atomic energy competitive with our present low cost power.

Using Atomic Energy for Fuel

By Kalman Steiner

• Fuel sources are diminishing, applications are changing, and demands for energy are increasing. — Will resources be adequate for the future? An article covering the coal, oil, gas and synthetic fuel situation was published in the January HPAC. Here is a review of the atomic fuel potential.

THE MOST WIDELY DISCUSSED, and possibly the most extensively studied new energy source is, of course, nuclear energy. Few aspects of modern civilization present more drama and exciting speculation. In 1939 the U.S. government made its initial appropriation to study atomic fission. The amount: $6000. By June 1953, the government had spent $8.4 billion. In January 1954 President Eisenhower requested an additional $1.4 billion, and included an item of $2.4 billion for the fiscal year beginning July 1954, for the atomic energy program.

Of course, some 90 percent of government effort has been directed toward military uses of nuclear fission. But soon after the end of the war, the Atomic Energy Commission invited a number of representative industrial groups to enter upon investigations of peacetime uses.

The Atomic Energy Act of 1954 gives industry much wider latitude in participating in nuclear fission development. Industry may now own and operate atomic energy facilities, regulated by AEC. Ownership of fissionable materials is still retained by AEC; industry must lease the material from the government. The new law stipulates that anyone obtaining a patent as a result of development and investigation under this program is required to license the patent to anyone else desiring such license, for the next five years. The law liberalizes the dissemination of information heretofore classified. AEC supervises and regulates health and safety measures in all atomic facilities.

The fission process, with attendant release of energy, is carried on in a structure called a reactor. Great sums of money have been spent in studying and developing reactors. No final form has yet crystallized. There are at least 80 conceivable designs. A particular design is affected by the different available fissionable materials — nuclear fuels — different moderators controlling fission rate, coolants, and the specific purpose or application of the reactor.

For commercial power generation, five reactor types have emerged as the most promising. These are known as the pressurized water reactor (PWR), boiling water reactor, sodium-graphite reactor, homogeneous reactor, and fast breeder reactor. The first three are considered as the most likely for immediate use, the last two as the long range and more economical types but requiring considerably more research before commercial consideration can be given them. The homogeneous and fast breeder have the distinct advantage of creating more atomic fuel than is consumed. The homogeneous is also referred to as the thermal breeder.

Coal burning electric generating stations produce a kilowatt hour of power at a cost varying from 5 to 8 mills, depending of course on the cost of coal, the size and efficiency of the plant. For the total electric power consumed in the U. S., every mill saved in producing power represents an annual saving of $350 million. It is not yet expected that a nuclear fission plant can equal lowest coal cost. It is hoped to make power at a cost under 8 mills. Ultimately, as experience is acquired, nuclear power may be brought down to a cost of 5 mills per kwhr.

The most modern coal burning central station today can be erected at a cost of about $163 per kw

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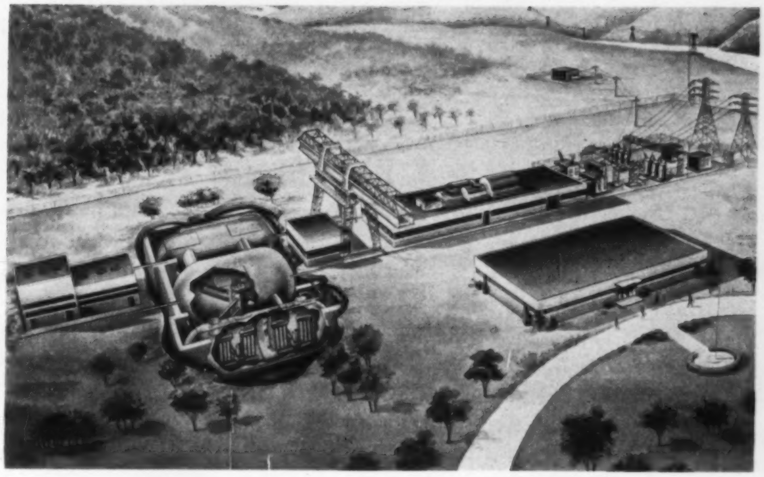
Mr. Steiner, of C. Hoffberger Co., has written widely on fuels from a background of much practical experience and careful analysis. In recent years, he has summarized the fuel situation annually for HPAC. He is a member of HPAC's board of consulting and contributing editors.



SHIPPINGPORT, PA., the first nuclear power plant for industry, will have a capacity of 60,000 kw, and will have a pressurized water reactor. Except for reactor and boilers, equipment will be conventional

capacity. Nuclear power plants of commercial size will at first cost as much as $250 per kw capacity, but experience acquired in design and erection is expected to bring the cost down to $150.

The first commercial nuclear power plant is now under construction at Shippingport, Pa. It will have a capacity of 60,000 kw, and will have a pressurized water reactor. Except for the reactor and boilers, all other equipment, such as turbine, generator, and auxiliaries, will be of conventional central station design. The plant will be operated by Duquesne Light Co.

The Nuclear Power Process

The reactor is the nuclear furnace. In it the fissionable material or fuel is brought into contact with the neutrons that induce fission. The heat released by the process is picked up by the circulating water called the coolant. The coolant or primary water will be under a pressure of 2000 psi, at a temperature of 525 F. The primary circulation passes from the reactor to four heat exchangers or boilers, where the heat of the coolant is removed to generate steam at 600 psi. Steam passes to the turbine as in any conventional central station to drive the electric generator.

Normally, three of the four boilers will carry the load, leaving one as a spare. The pump in each loop circulates about 16,000 gpm of primary water to make a total of 48,000 gpm for normal load. Each loop requires about 1000 hydraulic horsepower to circulate the primary water. All surfaces in contact with primary water will probably be made of stainless steel. Pressure in the primary system will be maintained at 2000 psi by a pressurizing tank which floats on the system and is connected to one of the reactor pipes. The tank is normally filled with equal volumes of water and saturated steam at over 600 F.

The steam generators or boilers will consist of two major components, a heat exchanger and a steam drum. The heat exchanger will comprise a bundle of stainless steel tubes with the ends welded into heavy tube sheets. The entire assembly is enclosed in a steel shell. Primary coolant will flow through the tubes, boiler feedwater through the shell and around the tubes. The steam generated will rise to the steam drum to be dried by passing through a conventional steam separator.

The most interesting part of the plant, of course, is the furnace, or reactor core. The heat generating material will be slightly enriched uranium containing a slightly higher amount of U_{235} isotope than natural uranium as mined. More than 10 tons of uranium will be used in the first core. The fuel elements will be protected by a corrosion resistant material designed to prevent the coolant water from becoming contaminated with particles of uranium and fission products. These fuel elements will be formed into a cylinder about 6 ft in diameter and 7.5 ft high. The maximum fuel element surface temperature will be less than 636 F, the boiling point of water at 2000 psi. The maximum heat flux will be over 350,000 Btu per sq ft per hr, and the average power density will be about 45 kw of heat per liter.

The entire primary unit will be enclosed in a steel container to retain any radioactive material which might escape as result of an accident. Although such accidents are extremely improbable, safety requirements are such that, at least in this first plant, great precautions must be taken. The complete plant is protected by concrete shielding.

In the light of the world's energy needs — keeping in mind the changes which have taken place in the last 50 years and the current technological development programs — the next 50 years will certainly see an even more startling change in our pattern of tapping fuels for heat and power.

The author wishes to express his thanks to the Atomic Power Division of Westinghouse Electric Corp. for permission to extract from a paper delivered by C. H. Weaver before the Atomic Industrial Forum, Washington, on May 24, 1954.

1 IN PROCESS of being completely air conditioned is Chicago's Drake hotel

• In sizing the piping and components of the system, ultra-conservatism was the rule, so that additional tiers can be added to the distribution headers if desired. The system consists of a 100 ton refrigerating compressor, water chiller and circulating pump mounted in a penthouse on the floor beneath the roof; an evaporative condenser installed on the roof; individual room cooling units mounted in the upper part of guest room closets; a four-pipe set of risers, for supply, return, reverse return and drip drain; and individual room thermostatic control.

Cooling The Drake Hotel

. . . with a central air conditioning system makes it cooler by the lake whether windows and transoms are open or closed

By J. R. MacArthur
Chief Engineer,
The Drake Hotel

As PART of a program to air condition all or the greater part of its guest rooms, The Drake last year took the first step by air conditioning 152 rooms, with a central system using chilled water and individual room cooling units.

Four years ago, conventional window units were installed in a number of guest rooms but did not meet The Drake's particular requirements. The Drake overlooks Lake Michigan, Lincoln Park and the merger of Michigan Ave. and Lake Shore Drive. Previously, window units partially blocked this lovely view for guests seated in their rooms. Some guests found the units too noisy to leave in operation all night. With the windows sealed, they felt shut in and, on a mild day, could not open the window to admit the fresh lake breezes. From a maintenance viewpoint, we have found that the window units must be taken out in the winter, and during the summer we cannot wash the windows without first removing the units.

Convinced that window air conditioners were not the answer — though we are still using some of them to supplement our new system until all guest rooms are air conditioned — we began investigating other types of air conditioning. We felt that by eliminating the imperfections and using the good points of several types, and incorporating some ideas of our own, we could design an air conditioning system which would meet our requirements.

Difficult To Plan

There are many things to take into consideration when planning to air condition an existing structure in which no provision had been made at the time it was built. In the first place, hotels are not designed with extra space. Competition in the hotel field and building costs demand that every square foot of floor space be utilized as revenue producing or for service facilities, so that finding space even for today's modern, compact equipment is no small undertaking. It requires more planning than new construction.

When it is further considered that you must have ducts or pipes connecting the equipment to the remotest room on the system, you are confronted with problems of changing the architecture without impairing decorative appearances. Since the installation must proceed with the least possible interruption to hotel operation, it must be determined whether to do one floor at a time, or one wing or a vertical section.

After a consultation between management, front office and engineering, it was decided, as the first step in our program, to air condition 112 rooms of varying sizes, from the smallest single room to a spacious three-room suite, scattered throughout the hotel.

After drawing preliminary plans, obtaining independent opinions from consultants in the field, and preparing cost estimates on four different types of systems, we picked a chilled water type which we felt was best adapted to our building and which eliminated most of the imperfections and service troubles which we had found in systems of similar type.

Special System Designed

We rejected many good systems for several reasons. Some were inflexible in their application for they had to cover an entire section of the building at one time. Some necessitated lowering ceilings, sealing windows and breaking holes through floor slabs in sizes which could only be done with air hammers. We did not want to recirculate air from one room which might eventually be supplied to another.

When our plans were well on the way to completion, a test unit was installed in one of our transient rooms to which we hooked a "Freon" compressor with a constant pressure valve which we set to simulate chilled water conditions exactly. A recording thermometer and humidistat were placed in the room and an accurate record of outside temperatures was kept during the hot weather in 1953. This showed a room temperature 20 F below the outside temperature when it was in the 90 F bracket. Room humidity was held at approximately 50 percent.

The system as installed consists of a 100 ton refrigerating compressor, a water chiller, and a circulating pump, installed in a penthouse room immediately under the roof, and an evaporative condenser installed outdoors on an adjacent roof. Putting this equipment in place meant hoisting the refrigerating compressor and water chiller to the top floor through an elevator shaft, and hoisting the evaporative condenser outside the building. We also had to remove and replace several walls, though this has come to be routine work in the average hotel day.

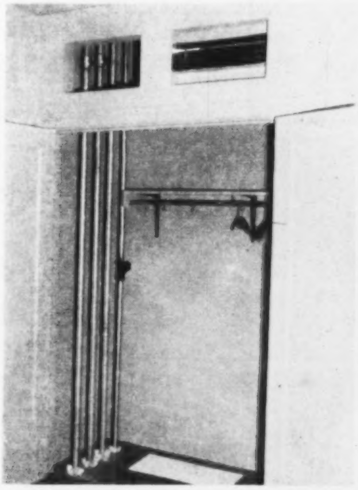
How System Was Installed

Vertical riser pipes were installed in one end of the guest room closets, and the room cooling unit was installed in the top of the closet above the door. The units vary in size, according to the size of the guest rooms. The riser pipe system consists of four pipes running from the lowest floor served to the attic space where they connect with the main distributor headers. The four pipes in each set of risers are for supply, return, reverse return and drip drain. The reverse return pipe forces all the chilled water from the highest and lowest room cooling units to travel the same distance, thereby eliminating any chance of the chilled water short-circuiting and failing to flow through all the units in equal quantity.

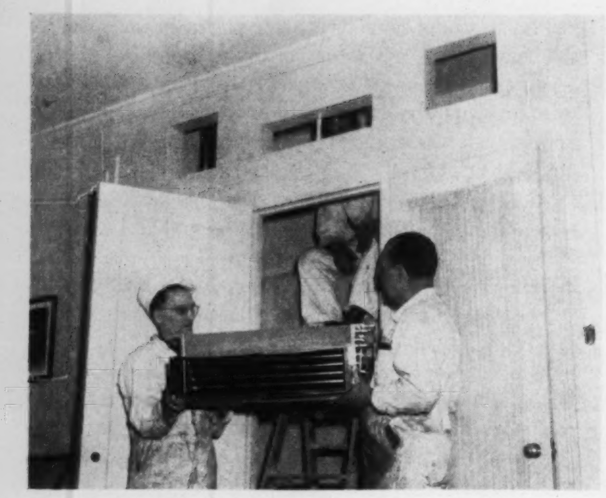
The chilled water headers in the attic space lead to the chilled water circulating pump which pumps it

2 TWO CONCRETE DRILLING MACHINES were used in boring 360 holes, 4 in. in diameter, through 9½ in. concrete floors

3 FIRST PIPE is installed through opening. Reverse return pipe assures flow of chilled water equally through all units

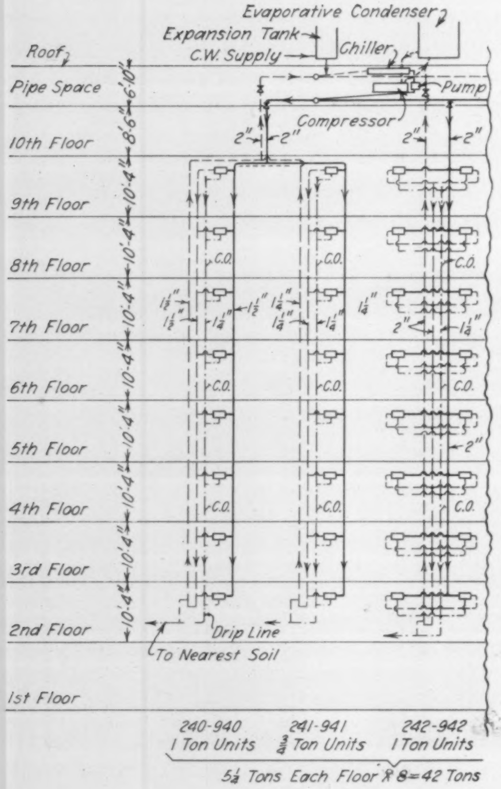


4 VERTICAL RISER SYSTEM through closets consists of four pipes, for supply, return, reverse return and condensate drip line

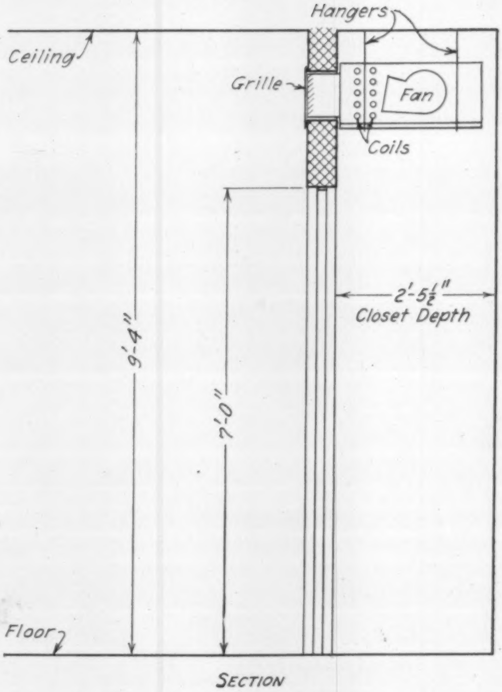


5 COOLING UNIT is hoisted up to a closet. Installation of 152 units and central system piping and alterations required six months

6 VERTICAL PIPING had to be installed through eight tiers of rooms. Where rooms did not match, pipes had to be rerouted. Careful pre-planning kept these problems to a minimum


Evaporative Condenser
Expansion Tank
C.W. Supply
Chiller
Roof
Pipe Space
6'-10"
Pump
Compressor
10th Floor
8'-6"
2"
2"
2"
2"
9th Floor
10'-4"
8th Floor
C.O.
7th Floor
1½"
1½"
1¼"
1½"
1¼"
1¼"
1¼"
1¼"
2"
1¼"
6th Floor
C.O.
5th Floor
2"
4th Floor
C.O.
3rd Floor
2nd Floor
Drip Line
To Nearest Soil
1st Floor
240-940
1 Ton Units
241-941
¾ Ton Units
242-942
1 Ton Units
5¼ Tons Each Floor X 8=42 Tons

7 VERTICAL SKETCH OF PIPING LAYOUT shows a part of the overall installation. Units range from ½ to 1½ tons


Hangers
Ceiling
Grille
Fan
Coils
2'-5½"
Closet Depth
9'-4"
7'-0"
Floor
SECTION

8 FAN AND COILS are suspended from ceiling in closets. Units are sized to cool rooms even if windows or transoms are opened through the chiller, out to the supply header, through the riser pipes and the room cooling units, and through the return risers and return headers, back to the pump. All horizontal runs of pipe and branches are pitched to avoid air entrapment, and a closed expansion tank was tapped in at the high point of the return header which also proves effective as an automatic air vent. Riser pipes were sized for the velocity and pressure drop of the particular room cooling units of the section they serve. All piping used is galvanized; run-outs to cooling units are copper with solder fittings. Insulation is double 3/4 in. wool felt covering.

Before we installed the risers we had to drill holes in the floors large enough to take the pipe and its insulated covering. This required drilling 360 4 in. diameter holes through 9½ in. thick concrete slabs. We encountered an average of two and one-half concrete reinforcing rods of ½ in. thickness in each hole drilled. Drilling was so quiet that there was no objectionable noise more than one room away from the drilling site. It took about an hour and a half to drill each hole. A 4 in. diameter hole takes a 2 in. riser with the inner three quarter thick covering extending through the hole in the concrete slab and the outer three quarter part of the covering butted down against the floor and up against ceiling. For 1½ in. pipe risers, 3½ in. diameter holes were drilled and for 1¼ in. pipes, 3¼ in. diameter holes.

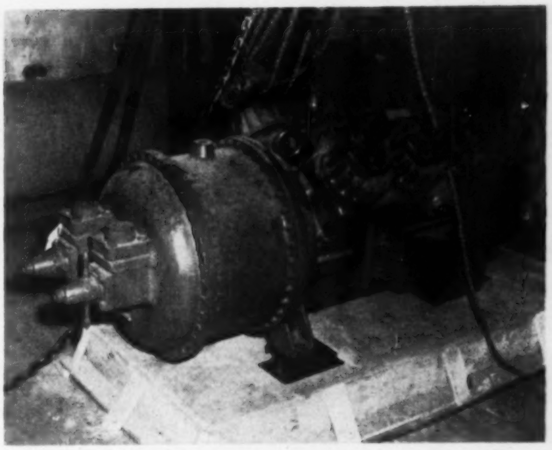
Each room cooling unit consists of an all aluminum case, a four-row copper coil with copper fins, a three-speed blower motor and an insulated drip pan. Air vents and balancing valves were installed at each unit. A three speed switch especially made for this was installed for the control of each room unit. We also had our own brass switch plates, custom designed and made so that guests can simply dial whatever degree of cooling they wish.

Windows May Be Opened

The unit was designed to recirculate the air in the room 10 times per hour with the room blower set at high speed. An exhaust rate of 50 cfm from the bathrooms is maintained, causing some infiltration of air. However, the units are sized so that the windows or the transom may be opened without affecting the cooling of the room. To our knowledge, this is a unique feature among hotels in the country.

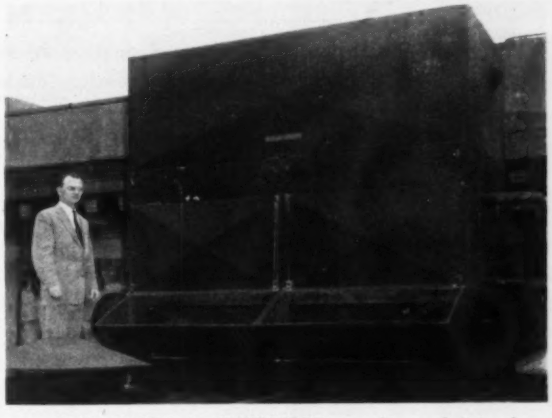
The noise level of each room cooling unit is below 35 decibels — less than that made by the average electric fan. Recirculated air is taken through the upper part of the closet through a grille placed inconspicuously. Inside this grille is an air filter, which does not require a holding frame. This arrangement allowed us to increase the filter area 50 percent, thereby reducing frequent filter changes.

Although we provided air vents and balancing valves in all the room units and other points in the system, we



9 100 TON COMPRESSOR, installed on the floor beneath the roof, is lowered into place on a 6 in. concrete block with 2 in. cork base. Water chiller is at the rear

10 EVAPORATIVE CONDENSER is hoisted up to roof of the hotel. While this operation was the most spectacular to onlookers, it involved less planning than any other phase



11 CONDENSER IS INSTALLED on the roof just above the 11th floor penthouse location of the compressor, chiller and circulating pump

12 DESIRED ROOM TEMPERATURE is dialed by E. L. Brashears, hotel president. A three-speed switch controls the unit in each room

13 CONTROL PANEL, located in the sub-roof penthouse, tells the complete story of how the system is working at a glance

"GUESTS WANT AIR CONDITIONING AT ALL TIMES"

did not have to open a single vent or adjust any of the valves when we turned the system on. We just opened all the balancing valves wide, filled the system with water, and started the equipment.

During the 1954 season we did not have a single complaint on the effectiveness of the system. Many people expressed amazement that they could have the windows wide open on the hottest days and still enjoy comfortable room temperatures. The equipment was operated continuously from June 1 through September 15. On several occasions, when the outside temperature dropped below 70 F, we tried shutting the system down at midnight, but it soon became evident that our guests wanted it operating at all times.

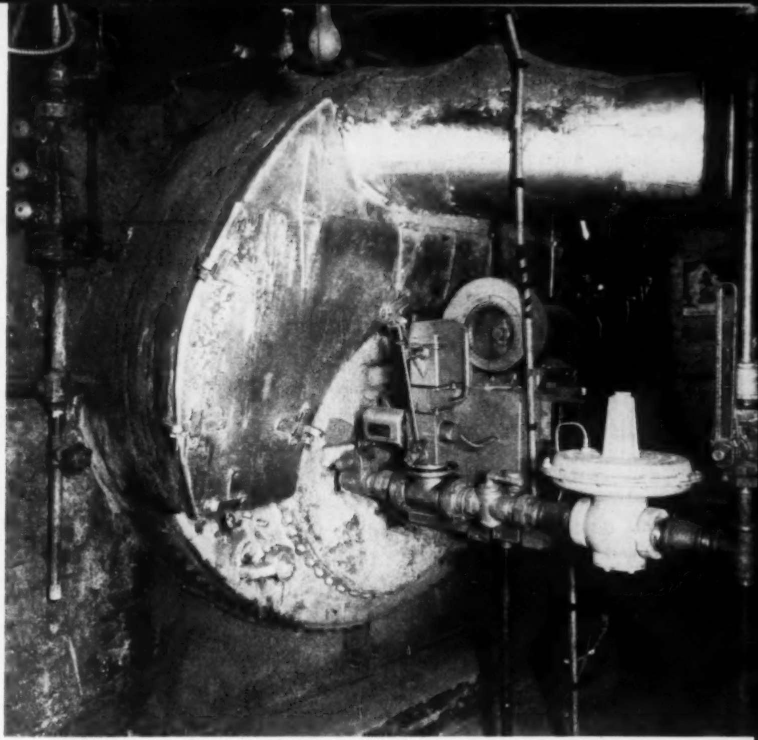
Cost: $600 per Room

We were ultra-conservative in sizing of piping and units. Distributor headers were sized so that additional tiers could be added to the same system if found feasible. In figuring the cooling load, we disregarded the fact that in most cases the heat gain through sidewalls would be slight since rooms on one or both sides of each room would also be air conditioned. We also disregarded the flywheel effect of all rooms not calling for maximum cooling at the same time; neither would all rooms have maximum occupancy during the hottest part of the day.

The original installation was 112 rooms to which we later added 16 and finally another 24, making a total of 152 rooms. On the basis of 152 rooms our installation cost was well below $600 per room. The writer does not claim that this system can be installed in any building for that price. It was designed with one specific building structure in mind. However, I believe there are many existing buildings where this type of air conditioning may be the answer to the problem. I know of no reason why it could not be applied horizontally as well as vertically, providing the piping is properly pitched to avoid air entrapment. With the addition of a heat exchanger and thermostats, the system might easily be used for heating as well as cooling, a fact which might make it attractive to owners of older buildings where the heating system piping is a problem.

In The Drake, the guests are the boss, and it is a source of great satisfaction to know that they are pleased with what has been done for them. Their comments in comparing our system with others of their knowledge have convinced us of its merits. We are now adding another identical system to serve an additional 150 rooms.

The installation was made by Refrigeration Systems, Inc., of Chicago.



SCOTCH MARINE BOILERS usually have a large firing tube which simplifies mounting problems and gives good combustion space

How To Convert Boilers To Gas-Oil Firing

By Robert Pixler

Eclipse Fuel Engineering Co.

Here are the answers to some of the questions on converting to gas-oil firing. The author has drawn upon his wide experience to explain the factors involved and what should be done to achieve good performance.

SINCE WORLD WAR II a vast expansion in the distribution of natural gas and a rise in the application of boilers to automatic heating and process operations have led to many installations of combined gas-oil firing.

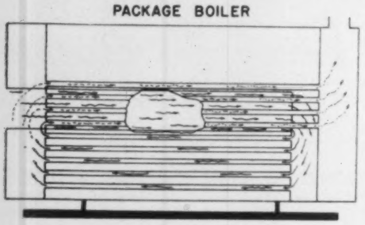
In most areas, the gas utilities have the ability to service a much greater load if they have a method of cutting down on those few peak days when temperatures are abnormally low. If at this point the gas companies have a relatively few larger users who can be switched to an alternate fuel, the load factor becomes very attractive.

The opposite of this situation is the process boilers and heaters, which are normally in operation throughout the entire year. During the summer months, the utility companies have a surplus of fuel available, since there is no domestic heating load. At this time, the utilities have the ability to serve offpeak users on an attractive interruptible or dump load rate.

These are the two conditions which promote combination gas-oil firing: (1) the commercial and industrial heating loads, which can normally be carried, except under very low temperature conditions, on the interruptible basis; (2) the process load demands, which extend over a 12 month period and can economically take advantage of the offpeak or dump load gas rate.

Tremendous changes took place in boiler design during World War II. The so-called package boiler or steam generator came into being in volume at this time. The water capacity of this type of unit was drastically reduced, the firing tubes became very small in relation to the time-honored Scotch marine boiler design, multipass units became popular, and the percentages of overfiring, or firing rate versus combustion space or heating surface, was increased to as high as 250 to 300 percent of previously accepted standards.

PACKAGE BOILER



LOW OR HIGH PRESSURE, HORIZONTAL, THREE PASS, FIRETUBE, INTERNALLY FIRED BOILER

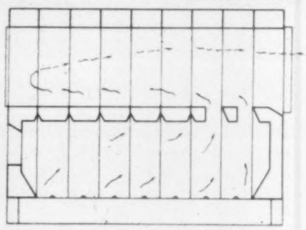
Because most of these units are shipped as packages complete with burners, it is not our purpose here to discuss this type of application. These boilers are very difficult to convert with a standard burner because of the various engineering complications that usually result. Normally, the burners designed for these units are special and peculiar to the unit on which they are applied. Usually, the combustion chambers have a considerable back pressure, combustion space is limited, and, unless the burner equipment and firing method are carefully chosen, operating complications may result.

Types of Boilers

Because of the above, and the fact that most of this equipment is postwar, the demand for conversion equipment on this type of boiler is very low. The field of fruitful conversion possibilities exists largely on older types of equipment, probably installed before 1941. Since normal boiler life under favorable conditions is from 20 to 40 years, and since these boilers represent a considerable capital investment, the conversion of older units is very desirable from the user's viewpoint.

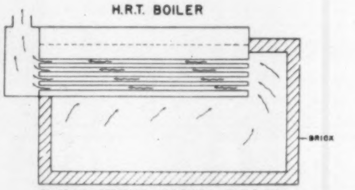
The conversion of conventional low pressure, cast iron sectional boilers is relatively simple. Normally, there is adequate stack draft available, the combustion volumes in the firebox are usually quite liberal, and the height of the combustion chamber and setting is usually sufficient to present no problems in the application and mounting of the burner. Through the use of baffles, especially in the latter passes of the unit, good efficiencies may be obtained.

LOW PRESSURE CAST IRON SECTIONAL BOILER



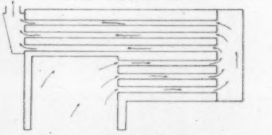
The next common type of boiler application is the brick set HRT, single-pass, which is popular in both heating and process load applications and has a multitude of design variations. Other types of boilers are the two-pass firetube, internally fired boiler, having a water leg extension around the firebox for additional heating surface; the low pressure horizontal, two-pass firetube boiler, which is also internally fired (that is, having a water jacket around the firing chamber); the horizontal, two-pass firetube, externally fired boiler, which is similar to the HRT except that it has a two-pass design (which is accomplished by dropping a drum down below the main boiler shell and taking the first pass of the gases from the firing chamber through this section); and the locomotive type boiler, which is also referred to as an oil field type unit.

H.R.T. BOILER

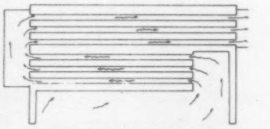


LOW OR HIGH PRESSURE, HORIZONTAL, SINGLE PASS, FIRETUBE, EXTERNALLY FIRED BOILER

TWO PASS BOILERS

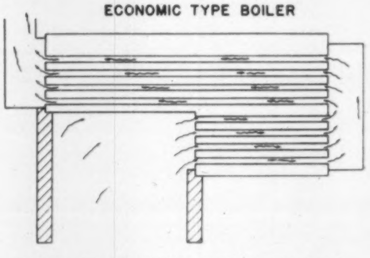


LOW OR HIGH PRESSURE, HORIZONTAL, TWO PASS, FIRETUBE, INTERNALLY FIRED BOILER



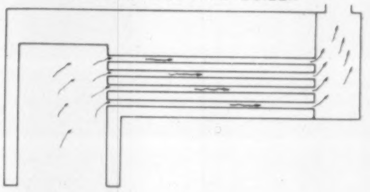
LOW PRESSURE, HORIZONTAL, TWO PASS FIRETUBE, INTERNALLY FIRED BOILER

ECONOMIC TYPE BOILER



HORIZONTAL, TWO PASS, FIRETUBE, EXTERNALLY FIRED BOILER

LOCOMOTIVE TYPE BOILER



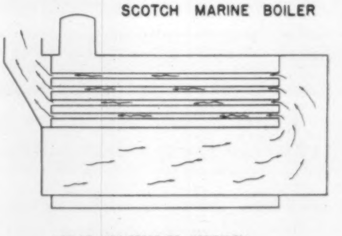
LOW OR HIGH PRESSURE, HORIZONTAL, SINGLE PASS, FIRETUBE, INTERNALLY FIRED BOILER

It is of firetube design, single-pass, and probably not quite as common as the previous types in this class. However, it does have the advantage of taking a considerable overfire input.

How To Convert Scotch Marine

One of the most common conversion applications is the Scotch marine boiler. It is of the two-pass, firetube design, either dry back or wet back end construction. It has a large firing tube and the basis of rating this boiler is usually on a calculation of 10 sq ft of heating surface per boiler hp. It is possible to ac-

SCOTCH MARINE BOILER



LOW OR HIGH PRESSURE, HORIZONTAL, TWO PASS, FIRETUBE, INTERNALLY FIRED BOILER complish a great deal with conversion burners on this type of boiler.

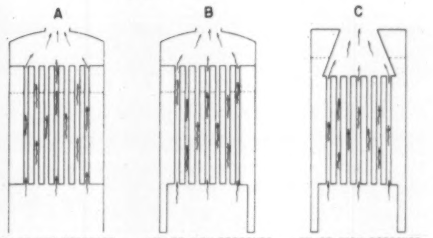
Usually this type of boiler has a good stack used in conjunction with it and, therefore, good draft is available. The large firing tube eliminates a great deal of mounting and application problems and also gives good combustion space volume. In converting this boiler, it is possible to go from 150 to 200 percent of nominal rating without any difficulty and still maintain very acceptable efficiencies. Through the use of spinners in the return tubes, it is possible to approach efficiencies of 75 to 80 percent, even at accelerated firing rates. However, this of course goes back to the type of burner equipment selected and, at these efficiencies, it becomes important.

The only problem commonly attached to conversion of the Scotch marine boiler is that troubles are sometimes encountered because the burner equipment is firing into a tube that is usually not lined with firebrick material. It is desirable to make careful selection of burner equipment on this type of application, especially with regard to the possible pulsation troubles.

Vertical Boilers

The vertical firetube boiler is another that is normally encountered in conversion work. It is somewhat more difficult to apply since it necessitates the addition of some sort of combustion chamber below the unit. In most cases, this means the boiler has to be raised to accommodate the base. On coal fired vertical firetube boilers, the base is one of grate structure and not adaptable for the mounting of an automatic fuel burner. A refractory lined base is required to convert this boiler. Another thing peculiar to vertical boilers is that the size range is rather small, normally not over 75 to 100 hp at the largest, with most common sizes ranging from 20 to 40 hp.

VERTICAL FIRETUBE BOILERS



LOW OR HIGH PRESSURE
VERTICAL
SINGLE PASS
FIRETUBE
EXTERNALLY FIRED

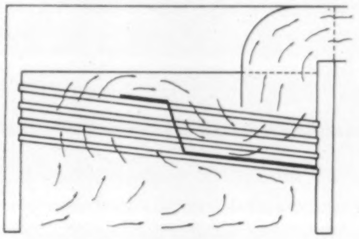
LOW OR HIGH PRESSURE
VERTICAL
SINGLE PASS
FIRETUBE
INTERNALLY FIRED

LOW OR HIGH PRESSURE
VERTICAL
SINGLE PASS
FIRETUBE
INTERNALLY FIRED
SUBMERGED TUBE OR HEAD
OR CONE HEAD

Water Tube Boilers

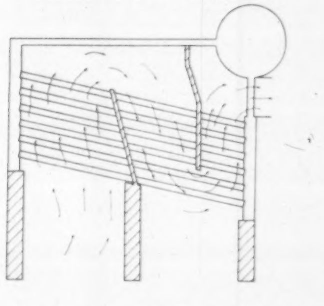
The largest general class of boiler is the water tube unit. In recent years, the water tube boiler, previously adapted only to larger installations, has been applied in sizes as small as from 10 to 16 hp.

STRAIGHT TUBE BOILERS



NCLINED, STRAIGHT WATER TUBE, LONGITUDINAL BOX HEADER, INTERNALLY FIRED BOILER

STRAIGHT TUBE BOILERS



INCLINED, STRAIGHT WATER TUBE, CROSS DRUM, SECTIONAL HEADER, EXTERNALLY FIRED BOILER

In the smaller field, the *A* frame unit has become increasingly popular, with many variations on the basic design. This type of boiler lends itself as easily to conversion as the HRT type and can be done without considerable structural change.

Another article on this subject will appear in a future issue.

Realize Business Need for Air Conditioning

. . . apartment, office buildings

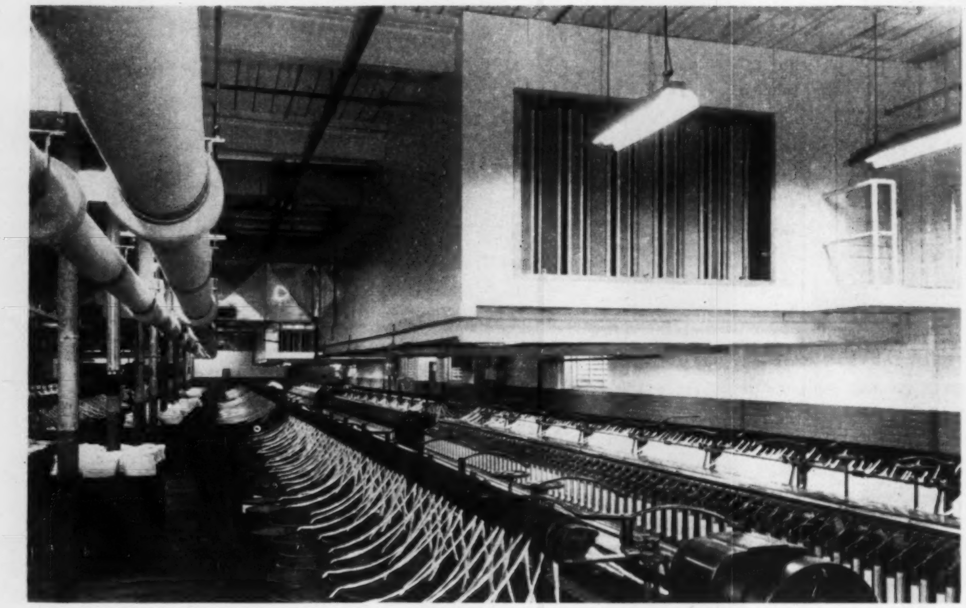
TWO UNRELATED — and yet related — news stories appeared in a recent issue of the Chicago Daily News.

The first quoted a vice president of a large real estate firm, talking to a group of electrical contractors on modernization opportunities. Because of the exodus to the suburbs, he said, it is only a short time before vacant apartments will appear in the city proper. The least desirable apartments, both by location and by physical standards, will be hit first — especially in higher rent groups, he predicted.

The other story announced the start of construction of the city's first air conditioned walk-up apartment building. At Summerdale and Rascher, it will contain 30 units of two and a half to five rooms. I. W. Rosenberg, who heads the building corporation, said that the demand for comfort can be expected to extend to walk-up apartment buildings in the next five years. "Centrally air conditioned walk-ups will enjoy a major advantage in the highly competitive rental market ahead," he predicted.

As is the case in many other cities, the business advantages of air conditioning to buildings of various types are becoming more widely appreciated in Chicago. It is felt by a number of architects, engineers and others that Chicago is starting a cycle of air conditioning its big downtown office buildings. For example, the best way of air conditioning a 42 story, 25 year old building is being studied. The first five floors are already air conditioned, and it is desired to handle the balance of the building in such a way that certain spaces can be bypassed if some tenants don't want air conditioning at the present time. The job involves some 3000 tons of refrigeration.

The air conditioned Prudential building, which is rapidly nearing completion on the city's lake front, has undoubtedly been a competitive stimulus to other office building installations.



SUSPENDED CENTRIFUGAL SPRAY air washer station in the card and roving room is mounted against the ceiling. Note insulated water lines and one of the stations with return air dampers and entry door

Air Conditioning Fathers

• In the early days of weaving in New England, boys wandered up and down the aisles of mills sprinkling water on the floor trying to approximate the humidity of Scotland for the right tension regularity of the yarn. Today, revolutionary new looms are in operation, designed on the principle that the atmosphere itself is a raw material. In complete detail, here is the account of a special air conditioning installation that achieved the precise atmosphere control such as is needed for this new era in weaving.

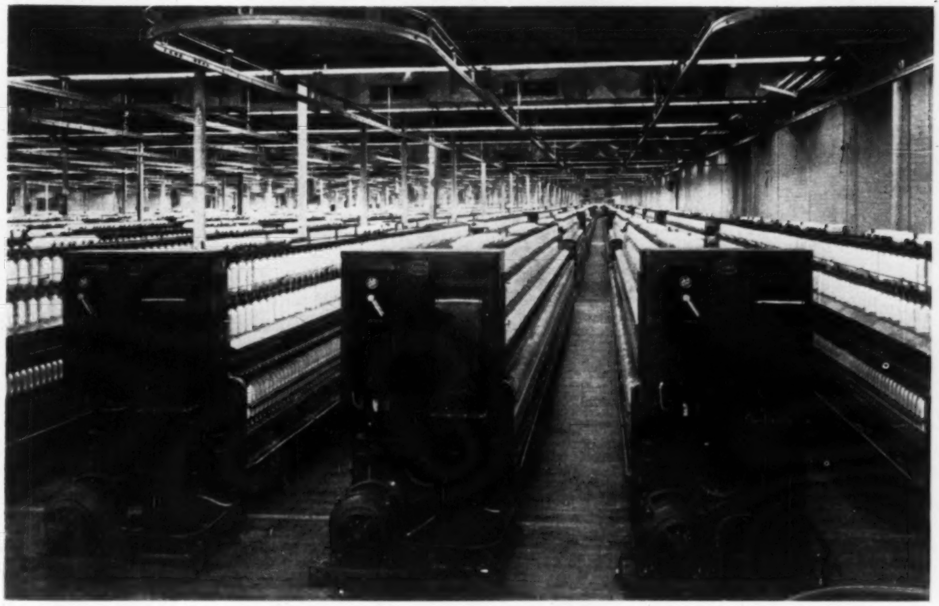
NEW AIR CONDITIONING systems, operating in conjunction with specially designed auxiliary equipment, have increased production efficiency and improved product quality at Borden Mills, Inc., Kingsport, Tenn.

In addition to greater comfort for workers and general improvement in cleanliness throughout the mill, are marked benefits to production through closer control of temperature and humidity. Another result, important to a textile mill having a tremendous investment in machinery, is the reduction of corrosion of machine parts. Already production has increased and parts replacement has been diminished considerably as a result of a new electro-magnetic loom hand in hand with air conditioning.

With the normal relative humidity in average weaving mills from 87 to 95 percent, lint sticks to everything from the faces of the operators to the gears of the looms, bacteria run riot, leather rots, metal rusts and even metal pipes corrode. The need for constant lubrication, cleaning, sweeping, adjusting and repairing caused by these conditions has now been completely eliminated. Working conditions of 64 percent relative humidity and a temperature not over 80 F have been proved entirely possible.

Over Million Cfm Required

The problem of proper air conditioning for this large cotton textile mill can be appreciated when it is



EIGHTEEN INDIVIDUAL centrifugal spray air washers in the spinning room maintain conditions of 80 F and 55 percent relative humidity uniformly the year 'round

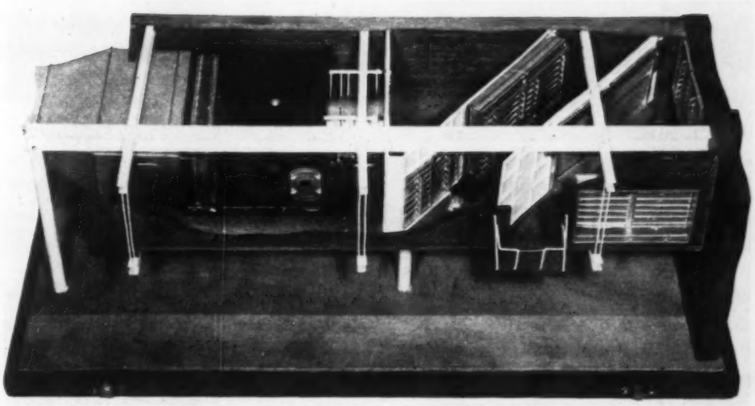
Weaving Revolution

R. M. Anderson

Engineer,
The Bahnson Co.

realized that air handling amounts to well over one million cfm to control temperature, humidity and air movement for optimum operation of the machinery and for full efficiency of the workers. The mill building is a four story structure — approximately 140 ft wide and 650 ft long.

Before the most recent installations, it was of typical textile mill construction with brick walls and numerous windows. A monitor ran the length of the building over the fourth story to provide light and ven-



CUTAWAY MODEL of a platform mounted station — with air flow right to left — shows outdoor air and return air dampers, automatic lint filters, cooling coils with face and bypass dampers, axial flow fan, evaporators in fan extension cylinder, washer, eliminators and distribution ductwork

DISTRIBUTION SYSTEM and controller for the 28,000 cfm station maintains uniform conditions at 80 F and 55 percent relative humidity in the opener room

tilation to the spinning room which occupies the entire fourth story. Water atomizing humidification equipment was in operation in most parts of the building, while the first and second story weave rooms were conditioned by an evaporative cooling system consisting of air distribution ducts and pneumatic atomizers.

When it was decided to install fully modern air conditioning systems in all portions of the building other than the weave rooms, the centrifugal spray air washer seemed to offer the solution required. The washer utilizes patented centrifugal evaporators, which allow a modulation of capacity and a refinement in control.

Brick Up All Windows

In connection with the air conditioning installation, it became advisable to brick up all windows to reduce loads. It was also apparent that the monitor should be floored over. When it was determined that most of this particular type of apparatus could be located in the monitor, with little construction expense beyond that which would be required to floor over the monitor for any air conditioning system, the system was selected.

The enclosed monitor now houses all equipment for conditioning the fourth story spinning room. The card and roving rooms, which occupy most of the third story, required a somewhat different approach, but again it was determined that the "unit station" could be installed without use of floor space or outside apparatus towers. The six stations required for this room were platform mounted This required few structural changes. so the clearance below the platform is sufficient to allow continued use of all floor space for machinery.

A cut away view of a station typical of those installed is on page 89. Axial flow fans, at the washer intake, deliver air .to a cylindrical section which contains the motor driven centrifugal evaporators. These evaporators, used in place of the spray nozzles of conventional washers, provide a fine, uniform mist which results in saturation of the air with a fraction of the amount of water circulated in a conventional air washer. The low water volume is recirculated through a central filter tank so that individual washers do not require deep tanks and recirculating pumps.

Since the reduced amount of water handled is not sufficient to provide cooling and dehumidification by spraying chilled water in the washer, water coils are used for these functions. This allows use of a completely closed chilled water circuit, which, though more expensive than an open circuit, greatly reduces maintenance by keeping lint and dirt out of the water lines and chiller.

The water coils also serve the heating function during the winter, when the circulated water is heated by a steam heat exchanger at a central point. This permits use of a single set of water circulating lines rather than separate chilled water and steam lines.

Modulating control of the humidification function is accomplished by regulating the amount of water supplied to the evaporators. Accurate control of the water temperature at a central point and regulation of coil face and bypass dampers at each station provide precise modulating control of temperature and dehumidification. Evaporative cooling, with all outdoor air, is utilized whenever possible to reduce refrigeration loads. Full recirculation, except for ventilation air, is utilized in heating.

The problem of proper air filtering is of paramount importance in all cotton textile mills because of the lint generated in the various processes. Automatic lint filters were therefore installed at all stations handling recirculated air. To facilitate a continuous check on the operation of the system, temperature and humidity recorders were installed in each control cabinet and recorder charts are kept on a large peg board in the office of the plant engineer, so that they are constantly available for reference.

Design Conditions

Refrigeration is furnished by two centrifugal compressors each rated at 885 tons of refrigeration. The refrigeration equipment cools 1890 gpm of circulated water from 56.2 F to 45 F at maximum operating conditions, using 85 F condensing water. The cooling tower is on a concrete tank near the mill building and is of the induced draft type, wood filled and handling condenser water at the rate of 5320 gpm.

The largest single area conditioned by the new system is the spinning room which occupies the entire fourth story. Eighteen washers, arranged in nine duplex stations in the monitor, deliver approximately 700,000 cfm of air. The spinning room is maintained at 80 F and 60 percent relative humidity throughout the year. On the story below, six washers are on platforms along the west wall with ducts extending the width of the room. Conditions of 80 F and 55 percent relative humidity are maintained, and the system handles a total of 216,000 cfm of air. On the same floor is the picker room which is conditioned by a platform mounted station handling 36,000 cfm and also maintaining 80 F and 55 percent relative humidity.

The second story is partially occupied by one of the weave rooms and also contains the warping, spooler and beam storage rooms. The latter areas are conditioned by a 40,000 cfm station which maintains 80 F and 55 percent throughout the year. Also, on the second story is the slasher room which is equipped with a 25,000 cfm suspended system. This system does not require an air washer since humidity control is not required in the slasher room, and all air used is outdoor air which is passed through coils for temperature control. The first story cloth room is conditioned by a platform mounted station handling 24,000 cfm and maintaining conditions of 80 F and 55 percent relative humidity. The first story opener room in the service building adjoining the mill is conditioned by a single station handling 28,000 cfm maintaining conditions of 80 F and 55 percent relative humidity. This equipment is located in an apparatus room adjacent to the opener room.

Maintenance a Factor

Prominent consideration was given to maintenance in the design and installation of this system. The closed chilled water circuit eliminates considerable maintenance of the water lines and chillers, while the use of automatic lint filters will greatly reduce maintenance at the individual stations. Use of a central tank to filter all recirculated water allows concentration of maintenance of the water system at one point rather than frequent cleaning of individual washers.

ALL WINDOWS of the four story main mill were bricked up to reduce the air conditioning load. Equipment is installed in the penthouse, formerly a roof monitor

The use of evaporators for spray generation is also a big factor in maintenance reduction. The use of axial flow fans on the dry side of the washer reduces fan maintenance because fans can be cleaned and repainted easily.

In addition to the conditioning of all manufacturing areas, the mill management provided an air conditioned cafeteria and two lunchrooms for the employees. The cafeteria and kitchen are conditioned by a 25 ton package unit and each lunchroom is conditioned by a 7½ ton unit. A separate office building contains executive offices and the first aid room and is conditioned by a 10 ton package unit. The cotton laboratory is also completely conditioned.

With the completion of the air conditioning project involving the 28 stations and several smaller units mentioned above, there remained the first and second story weave rooms without true modern air conditioning. Both of these rooms are equipped with evaporative cooling systems consisting of air distribution ducts with pneumatic atomizers for supplementary evaporation. This type of system was and is very popular in cotton weave rooms because evaporative cooling can provide comfortable working conditions and good processing conditions. However, the ultimate scheme of Borden Mills was to greatly improve working and processing conditions throughout the mill. Weave rooms are also among the most important areas in the textile mill as far as quality of product is concerned. The mill management determined that if quality could be increased, and the percentage of "seconds" reduced, they could well afford to modernize the weaving department.

Unique Exhaust Through Loom

Borden Mills started at the beginning, with the loom itself. Working with the Hunt Loom and Machine Works, they conducted experimental work which led to the development of an entirely new loom. Development work was conducted in an area which was partitioned from the main weave room, and the author's firm was called in to develop an air conditioning system to extend the many advantages of the new loom. Both the loom and the air conditioning system were tested under conditions equivalent to several years of normal operation, and the developments were finally completed to the satisfaction of the three firms. One section of the first story weave room was readied for the installation of 350 new looms and the air conditioning system was installed.

The design of both the loom and air conditioning system take into consideration the fact that cleanliness and the proper moisture content of the cotton warp, which results in tension regularity, can best be achieved by proper control of air conditions at the loom itself. A central station system delivers conditioned air to the weave room through rectangular ductwork. An exhaust chamber or trough, integral with the loom, runs the width of the loom below the drop wires. Air is drawn through each loom to the trough so that all conditioned air passes directly through the yarn. The air is then exhausted, by means of ducts under the floor, and returned to the central apparatus.

The system is complete with refrigeration to maintain a temperature of 80 F, while the relative humidity may be maintained as high as 75 percent without supplementary moisture being added in the room. It is anticipated that actual operating relative humidity may be in the lower 60's so that the room may remain sufficiently dry to prevent sticking of lint. This is a radical departure from the normal 80 to 85 percent, but allows the amount of cleaning in the room to be tremendously reduced and the efficiency of the weaving operation to be greatly increased.

The weaving areas will accommodate 2000 of the new looms when the full replacement program is complete, and this new type of air conditioning system will be used throughout the weaving areas. The first area is conditioned by two central station systems. The stations, one of which is located on either side of the building, have both air delivery fans and air exhaust fans. Axial flow fans were selected to reduce space requirements and to keep fan maintenance at a minimum. The air leaving the room passes through automatic filters which remove all lint and dirt before this air is returned to the apparatus for reconditioning. The conditioning is accomplished by two 30 ft wide × 10 ft high air washers. This particular washer uses special nozzles which provide performance equivalent to conventional single stage bank double washers with but a single bank of nozzles and with reduced water circulation requirements. A centrifugal "Freon" compressor develops 275 tons of refrigeration capacity for chilling the water, and condenser water is cooled by an induced draft cooling tower. The automatic controls for these systems, in return air plenums beyond the filters, remain clean, accurate and sensitive. By removing the automatic controls from the room, all tampering on the part of employees can be prevented. Absence of supplementary atomizing equipment in the room prevents any deposit of moisture on machinery.

All of these factors allow each worker to do more and better work under cleaner working conditions and in a healthier atmosphere. The comfortable and attractive work room draws high quality labor. The final results are more efficient weaving and a definitely superior product.

Largest Office Building with Air Conditioning

. . . 4000 *tons of capacity*

A CONTRACT exceeding $5 million covering the installation of the heating, ventilating, and air conditioning system in Manhattan's block square, 42 story Socony Vacuum building, now under construction, has been awarded. The contract is said to be one of the largest of its kind ever awarded.

The new building, with its 1,300,000 sq ft of rentable space, will be the world's largest single commercial office building with 100 percent air conditioning as an integral component of the structure itself. A total refrigerating capacity of 4000 tons will be installed.

The exterior zone system will be of the high pressure window unit type with each unit having its individual temperature control. There will also be several departures from conventional practice in the interior zone system. These include a high pressure, high velocity interior system throughout the entire building, a vertical, double duct hot and cold air system to all floors at the east and west ends of the building, and a unique arrangement of ducts leading from the sound absorbing control boxes to the air diffusers.

The vertical double duct system will be equipped with thermostatically controlled automatic mixing dampers at each floor. From the double duct system, the flow of the mixture of hot and cold conditioned air on each floor then is to overhead sound absorbing boxes, one of which will be located in each bay with each sound box, in turn, serving four overhead air diffusers.

The flow from the sound absorbing box to each of the air diffusers will be through a flexible conduit to a ceiling panel in which the air diffuser is installed. Each bay thus will contain a number of blank ceiling panels and four air diffuser panels, all of which are interchangeable at any time. This arrangement provides a maximum degree of flexibility since any air diffuser panel can be quickly and easily positioned, or later repositioned, according to partitioning requirements, with a minimum of inconvenience by simply exchanging a blank panel for an air diffuser panel without any change in the conduit.

The entire system is so arranged that much of the equipment is in only three places in the building. Three centrifugal machines with 2500 tons of capacity are in the sub-basement to serve all areas from that point to the 15th floor. Three more absorption type machines with 1500 tons of capacity are installed in the penthouse to serve the building's tower which rises from the 15th floor. The fans will be in the sub-basement, the 8th floor and the penthouse. This arrangement concentrates all major equipment for ease of maintenance. The installation will also include electrostatic filters.

Kerby Saunders, Inc., is the industrial and mechanical contractor. Owners of the building are Galbreath Corp., and the architects are Harrison & Abramovitz — John B. Peterkin. Jaros, Baum & Bolles are the consulting engineers.

ON THE JOB

Piping Data Revealed In Ice Rink Survey

. . . dependability cited

THIS STEEL PIPE being installed in an ice rink is 1 in. in diameter on 4 in. centers. Modern practice calls for welding the lengths of pipe together

Piping in ice rinks, if properly installed and maintained, is giving long dependable service, a recent survey reveals. Corrosion, once a major problem, seems to be under control. Piping installed 20 or more years ago is still giving satisfactory service. A majority of the installations reported were of steel pipe, followed closely by wrought iron pipe, both of which showed long service records.

Most of the pipe used is of either 1¼ in. or 1 in. diameter. A spacing of 4 in. between centers is used in half of the rinks that submitted reports, with others ranging from 2 in. to 8 in. Brine is reported to be overwhelmingly favored over ammonia and other refrigerants. In most cases, a corrosion inhibitor is used in the brine. Most of the pipe is uncoated.

This information was brought to light by questionnaires mailed to owners or managers of all United States and Canadian rinks with artificial ice installations, other than small studio rinks. Detailed replies were received from 52 U.S. rinks and 60 Canadian rinks, including a number of the largest in each country. The survey was conducted by the Spang-Chalfant Div. of The National Supply Co.

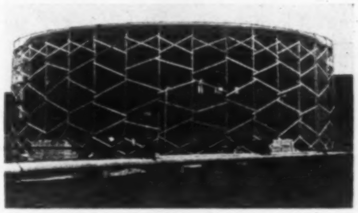
The greatest variation indicated in both countries is in the types of bases used. These range from simple installations, with the pipe resting on sleepers and covered by sand, to those using a variety of materials in carefully planned successsive layers. Concrete is used in one way or another in the bases of more than half of the rinks in the U.S., but in only one quarter of the Canadian rinks. Sand, with or without other materials, is used by more than half of the Canadian rinks. Other materials used in both countries include cork, cinders, gravel, crushed stone, and asphalt.

Huge Fuel Oil Tanks Get "Winter Overcoats"

. . . to cut steam costs

The Fuel Oil Corp. of River Rouge, Mich., faced with curtailment of steam needed to heat heavy fuel oil, decided to insulate its tanks. According to the Pittsburgh Corning Corp., over 50,000 sq ft of cellular glass insulation was applied to the four tanks, the largest of which is 117 ft in diameter x 41 ft, 10 in. high.

Two-in. thick blocks banded to the tanks were sprayed with a coat of asphalt cutback. Asphalt impregnated glass fabric was then imbedded in this coat and asphalt cutback sprayed on as the final coat.



ONE OF FOUR TANKS which were insulated with cellular glass insulation. Steam is used to keep fuel oil at a temperature of 120 F

Flush Mounted Filters Solve Lint Problem

. . . for packaged air conditioners

TWO 15 TON packaged units are part of 203 ton installation. Units range from 3 to 15 tons

The L&H Shirt Co., of Cochran, Ga., has licked the problem of lint. Previously the filters clogged up in a day. When 18 packaged air conditioning units were installed in the plant, the standard filters were removed. Then they were reinstalled in a sheet metal frame flush on the front of the unit, according to the General Electric Co.

This arrangement permits the filters to be vacuum cleaned each day. Lint does not penetrate the filters, but collects as a film on the front. The floor areas and work surfaces must be vacuum cleaned each night and the filters add only a few minutes to the cleanup work.

The factory occupies 32,500 sq ft. The package units range in size from 3 to 15 tons and total 203 tons in all. The entire factory uses four forced draft cooling towers for four zones of control.

The high heat loads in the sewing rooms, where people and machines are crowded into 16,000 sq ft, as well as in large areas with long air throw, were overcome by installing the units in the middle of the sewing area. Four-way distribution was provided by installing a double deflecting grille in the back of the plenum.

Uncontrolled Piping Motion

By Bill Dopp

• Bill Dopp has had some 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting part of his present leisure to drawing on his many piping experiences. All the names are fictitious.

This month, Mr. Dopp's principal character, Martin MacVane, listens to a problem involving the failure of globe bypass valves. He determines the cause of the failure and comes up with a practical solution, as usual.

THE BIG jovial Irishman seated behind the chief's desk in the Lakeview power plant smiled broadly at the young man seated beside his friend, Martin MacVane, on the other side of the desk. "So, — Mr. Lee Nelson, you are going to the University to be an engineer? If you turn out to be like your uncle here, you'll be a good one. I can tell you, though, that it will be a long time before you are as good as that."

"Never mind laying it on, Pat Murphy," demurred the grinning gasket salesman, "You're no slouch of a fixer yourself, running a job like this." He looked around the spacious, well appointed office. "I've seen you when you were sweating instead of smiling."

Pat Murphy got a chuckle out of that. Turning back to the aspiring youth, he observed, "Freshman, eh? Well, take every chance you get to be around a power house, or any kind of a plant for that matter." He squinted at Mac. "Did this old oil wiper really show you our pretty little station?"

"It looks awful big to me, sir," answered the boy politely. "It's taken us almost three hours to go through it, and I guess we have not seen all of it yet." He turned a grateful smile on Mac. "Uncle Mac has tried to explain everything to me, but much of it went over my head."

"It will do that at first," conceded the chief, "but you'll get used to it, and if you've got the engineer in you, you'll learn." He paused and looked out of the big window. "Tell me, what was your impression of it all?" Leaning back, he eyed the youngster shrewdly.

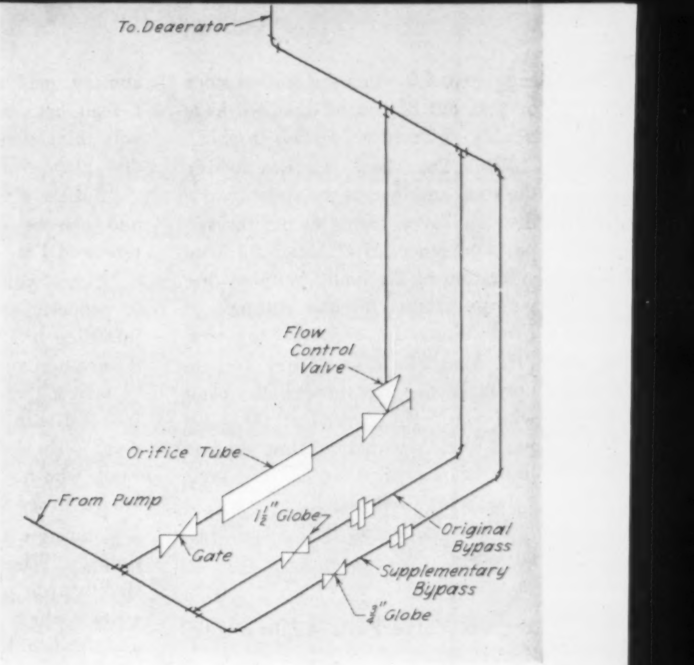
"Nothing Moves"

The young man pondered a moment, "Nothing moves," he said.

Pat Murphy and Mac shot startled glances at each other. Mac started to speak, but Pat beat him to it. "Nothing moves?" he demanded sharply, leaning forward. "Everything moves," he declared emphatically. "What do you think turns out the 200,000 kilowatts of electricity from this plant? The coal, the water, the steam, the turning turbines — yes, everything moves." His voice trailed off as he leaned back and began to smile again. "You tell 'em, Mac." He grinned at his friend, who had a slightly worried look. The boy, too, seemed quite amazed at the reaction to his remark.

"After all, Pat," chided Mac, "when you look at this plant of yours, it does look kind of dead. The old hog backs out there on the turbine floor surely are no inspiring sight to someone who doesn't know what it is all about. Look at your boilers," he scoffed. "Half the time you can't tell which is the firing end. Six stories high and twice as big as Old Abe's barn, you can't see the complete boiler from anywhere." He laughed at Pat. "In your day in the fire room, you could see the whole inside of the firebox when you opened the door to feed it. Now you really don't have a fire room. All you can see of the fire is a glimpse you get

Ruptures Valve



"THE SIMPLEST SOLUTION is to put in a supplementary bypass. Do it this way. Bridge the original 1½ in. line with a ¾ in. line and another globe valve. When the small valve won't take the load anymore, open the big one and close the small one."

looking through a peephole." His expression became serious. "I'll say the boy is right, at least in one sense — nothing moves."

Pat, ignoring Mac, studied the boy for a moment. Reaching over, he picked up some valve parts lying on the corner of his desk. He contemplated them for a moment, smiling broadly to himself. He spoke apologetically to Lee. "Look here, son, I did not mean to startle you the way I did, but you took me by surprise." He held up a badly battered valve disc.

"This valve is the victim of uncontrolled motion in a pipe line. It comes out of the feedback line from a boiler feed pump. Right now, we don't know what caused it to get like this, but we do know that it should not be this way. We also know that it was the movement of the water in the pipe that did the damage. It demonstrates what I was thinking."

"Everything Is in Motion"

He cast an inquiring glance at Mac and went on. "What I was referring to is the fact that everything in this plant is the result of things moving. You know, of course, that every particle of matter in the universe is in molecular motion, and that the movement of the molecules is determined by their temperature." He gestured broadly. "The action of the atoms, which make up the molecules, increases as the temperature goes up, until when we get to an atomic bomb, we've reached the point where the atoms cannot hold together any more. Then they split apart with devastating results. At absolute zero all motion inside the atom ceases — maybe." The boy nodded hesitatingly, keeping his eyes fixed on the chief. Mac looked on approvingly.

"Now, in this plant we take in coal. Locked up in that coal are a lot of little things that we call Btu's. I like to think of them as a lot of little gnomes who do our work. In the conveyors, we move the coal to hoppers and then to grinders, where it is pulverized for feeding into the boilers. All of that equipment is enclosed to keep down the dust. As a result, you can't see the motion from the outside."

"Uncle Mac explained that to me, but I never thought of the movement going on inside the closed parts," confessed the boy.

"You have to see beneath the surface of things," declared Pat. "When we get that coal into the boilers and burn it, the heat causes the Btu's, to jump out and run all over the place. Some of them escape into the surrounding air or up the stack, but most of them go right through the boiler tubes into the water in the boiler. That is what makes steam. Then we move the steam through pipes to the turbine, where it turns the spindle."

"It's really the Btu's that cause the steam to move," declared Mac, interrupting the lesson.

"That's right," agreed Pat. "The little devils are always trying to get away, and we have to do a lot of things to keep them under control — like putting heavy covering on all the steam and hot water pipes." He grinned. "When we get them into the turbine, we really play a trick on them. We put them to work turning that turbine spindle at about 3600 rpm, and so a lot of them think they are going to escape by running along the shaft to the other end. There we fool them because we lock them up in the electric current so that we can put them to work elsewhere." He was having fun with his whimsical explanation.

"You see, son," he went on thoughtfully, "everything is in motion. It's true that you can't see it; but if that were not true, this really would be a dead place, as your uncle suggested. It's when the motion stops or gets out of control that we have trouble — sometimes serious trouble."

While Pat talked, Mac was turning the stem and disc of the ruined valve over and over, trying to put the two parts together. His thoughtful consideration of the badly battered disc was interrupted by the entrance of Fred West, the assistant engineer. "Hi, Mac," he said. "Sorry I could not make the trip through the plant with you." He glanced at the valve parts that Mac held. "How do you like that combination? That's some valve, what's left of it!"

"How do you do it?" asked Mac, curiously.

Bypass Valve Fails Again

"I don't know. We've got three pumps. They are all hooked up exactly alike. This valve is in the bypass of the number three feedback to the deaerating heater. For the last year we have had trouble with that line. This is the fourth valve that has failed. The valve people were sure that this baby could not vibrate, because they made a disc stem connection so snug and smooth that it would hardly swivel. There was no play at all in the parts." He took the disc from Mac. "In spite of their care, look at this disc, after less than three months service."

Mac eyed the assistant quizzically, "How do you do it?" he repeated.

"I told you that I don't know," he replied, plainly irked by Mac's question. "Do you think we do it on purpose?"

"Fred," said Mac slowly, "valves talk." He paused. "They talk to those who know the language. These valves have been trying to tell you something that you have failed to understand." He reached for the disc. "I'll gamble that they are saying, 'Stop abusing me.' At least that is what I read here. Close throttling is the only thing that can do this to a plug disc globe valve."

"But these valves are seldom used, and then they are nearly wide open," protested Fred.

"Either you have failed to close it properly, or someone has been throttling it. Look." Mac drew a pad toward him and made a rough sketch. "I take it that you have these valves installed with the pressure under the disc?" He looked questioningly at Fred, who nodded. The boy was following every word.

Pointing with the pencil, Mac continued, "When you raise this disc slightly, you permit a thin stream of water to pass between the seat ring and the disc. It's hot water, and there is an immediate and sharp drop in pressure to the low side. The velocity keeps increasing until a critical point is reached, when cavitation begins to occur between the seat ring and the disc." He indicated a point about halfway up the disc. "This follows the usual pattern of make and break. No matter how snug you make that disc stem connection, it feels the effect of this intensely rapid vibration. No metal can stand up under that kind of impact for long. As the parts begin to fail, the vibration becomes more effective and soon you have this result." He handed the battered pieces to his nephew.

Fred stood looking thoughtfully out of the window. "I can't figure out what starts this thing." He picked up the pencil. "Here's the way that line is hooked up. From the top of the pump, the line comes over here and turns horizontally. This is the orifice tube, and here is the flow control valve. That's an angle valve pointing up. From there, the line goes up to the heater with a gate valve near the top." He shifted his position so that Lee could see what he was doing. "There is a tee and a gate ahead of the tube. That's where this bypass hooks in. Here is the globe valve. Then we have an ell and a riser with another ell to get back into the line above the flow control valve. It's as simple as can be."

"Fred, explain to this young man how that works," suggested Pat.

The assistant looked startled. "Well," he began slowly, "this line is connected into the delivery line of the boiler feed pump in front of the gate and check valves. It goes back to the suction side of the pump at the bottom of the deaerating heater. Its main purpose is to keep a constant flow of water through the pump regardless of the position of the disc in the boiler feed regulator. Should that be closed, or nearly closed, the water in the pump might flash into steam and cause serious trouble. This way, there is a flow that will prevent flashing and will recirculate water that is not needed under sudden changes in load conditions."

"What is the orifice tube for?" asked Lee diffidently.

Orifice Tube Takes the Shock

"This water being at a higher temperature than the water in the heater will partly flash into steam when it is released to a lower pressure. We used to tear good valves all to pieces when we tried to use them for the purpose of throttling that water. Now with these tubes, we let the orifice take the gaff, and by using a series of them the destruction is not too bad. The flow control valve in the line is specially designed to take part of that flashing." Fred pondered a moment. "But what gets me is that this bypass valve should give out. It's supposed to be closed tight except in cases when we are repairing the tubes or the flow valve."

> ***". . . No matter how snug you make that disc stem connection, it feels the effect of this intensely rapid vibration."***

". . . So we just crack that bypass valve to maintain our heat balance and keep the pump running steady."

"Always remember this, young man," said Pat earnestly, "water flashing into steam always creates high velocities. Passing through small openings, the mixture of water and steam is about as destructive to metals as anything that we know."

"You're right there," agreed Mac. "As Fred says, when we used valves to reduce the backfeed pressure, we were always in trouble. Just about everything has been tried. Nowadays they are getting away from the orifice tubes again and going back to specially designed venturi throat throttle valves to control the flow. From what I've heard, they still are having trouble."

"This has been one of the most troublesome lines in a power plant," observed Pat. "At first, it was a simple relief line, but its functions have changed so that now it is really important."

"Hello, Pete," greeted Fred, as another man joined the group. "This is Pete Armstrong, night engineer," he said to Lee.

"Glad to know you, Lee," said Pete. "Hello, Mac. Looking for trouble again?" he questioned.

Throttle with Globe Valve?

"Mac's found it right here," declared Pat. "We've been discussing this globe valve. Mac insists that this valve has been used in a closely throttled position."

"I think he's right," promptly declared Pete. "In fact, I know that he is. But why should that cause the valve to go to thunder?"

"One thing at a time," cautioned Pat, holding up his hand, as both Fred and Mac started to speak at once. "What's this you say about throttling that valve?"

Pete seemed startled at the intensity of their searching gaze. "We always use that valve when we have low loads, because we can't get enough water back to the deaerating heater through the flow control valve. So we just crack that bypass valve to maintain our heat balance and keep the pump running steady." He became uncomfortable under the sharp gaze of his chief. "Gosh, what's the line for, if you can't use it when you need it?"

"So there's your answer, Mac," conceded Fred. "These things usually drop right back into your own lap. I know a valve salesman who is going to thank you for the loss of a bad headache.

Put in a Supplemental Bypass

"There are several ways to take care of vibration in a plug type globe valve," answered the gasket salesman. "The simplest is to put in a supplementary bypass. Do it this way." He picked up the pencil again. "This original bypass is 1½ in., so we just bridge that valve with a ¾ in. line and another globe valve. The ¾ in. valve has an area of about 25 percent of the larger valve, so you can see that it will have to be almost wide open to pass the amount of water you might need. When the small valve won't take the load any more, you just open the big one, and close the small one. You will never have to throttle either one very close." He turned to Pete. "Don't forget, open those valves quickly or you are likely to get vibration at the start. Avoid that all you can."

"Mac, there is another way to stop that vibration," declared Pat. "Just turn that valve around, putting the pressure on top of the disc. I've tried that several times, and it works."

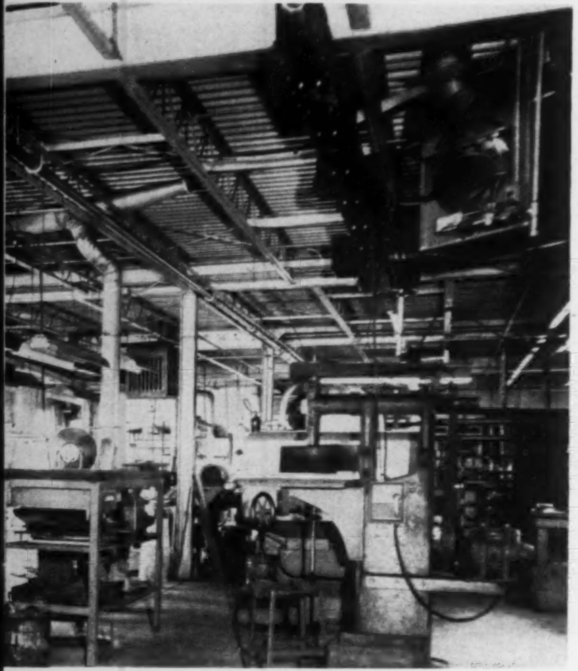
"I know that will work," asserted Mac, "but I'd hesitate to do that on any water line where you might get into serious trouble if the disc should part from the stem." He started to chuckle. "Some years ago, there was a transcontinental train stalled on the prairies for several hours because the stem had dropped the disc in a plug type valve that fed the air brake pumps. That disc became an effective check valve working in the wrong direction. I know several engineers who won't let anybody install a globe valve that way, not even in a steam line."

"Well," declared the chief, "if we find that we have to use that bypass in this fashion, we will install the two valve combination, and to make doubly sure that there will be no more trouble, we will install both valves with the pressure on top of the disc." He paused thoughtfully, "I want it understood, however, that this is not to become a general practice on water lines."

Pete started to say something about the practice of using the bypass, but Pat shook his head, evidently wishing to avoid discussion of the subject in the presence of his visitors. Pete turned away, shrugging his shoulders, knowing that he would hear more about the matter later. Pat turned to Lee Nelson. "You have had a very fine demonstration of how easy it is to misjudge a situation. You have also learned that using equipment for purposes for which it was not intended leads to trouble."

"I found out long ago that there is a lot about piping and valves that you can learn from practical experience," declared Fred.

"Right you are, Fred," asserted Pat. He got up to extend a cordial farewell.



1 EXHAUST SYSTEM requires 7000 cfm outdoor air and 5000 cfm recirculated air for make-up

By William M. Myler, Jr.
Chief Engineer
Surface Combustion Corp.

After-Mix Scheme

• Uncontrolled infiltration, as a result of a special exhaust system to remove abrasive dust, was causing great discomfort to workers in this small foundry. Not only that, the negative pressures were interfering with combustion in the unit heaters. The author explains how an after-mix system was used with direct gas fired duct heaters to provide adequate tempered make-up air for comfort, proper exhaust system performance and good equipment operation.

THE TEMPERING of outdoor make-up air to replace that lost through exhaust systems, now in wide use in industry, is a major problem that requires careful consideration.

Make-up air is needed in any heated structure. In too many cases, natural infiltration is the only method by which this air is supplied. The use of mechanical exhaust systems to remove dust and fumes, however, has created excessive, uncontrolled infiltration problems, with an accompanying increase in worker discomfort from cold drafts. To correct this, many plants have installed blower systems and direct fired heating units to bring in and temper outdoor air to replace that removed through the exhaust system.

Problems Are Typical

The particular problems faced by the engineers in selecting and installing the proper system for the Fremont Tool and Die Co., Fremont, Ohio, are typical of others often encountered. In the new plant, which replaced the old one that was leveled by fire, it was decided to install individual gas fired unit heaters.

A special exhaust system was also installed to remove the abrasive dust resulting from the grinding and polishing of the precision cutting dies manufactured. Soon after the exhaust system was installed, two things were immediately evident:

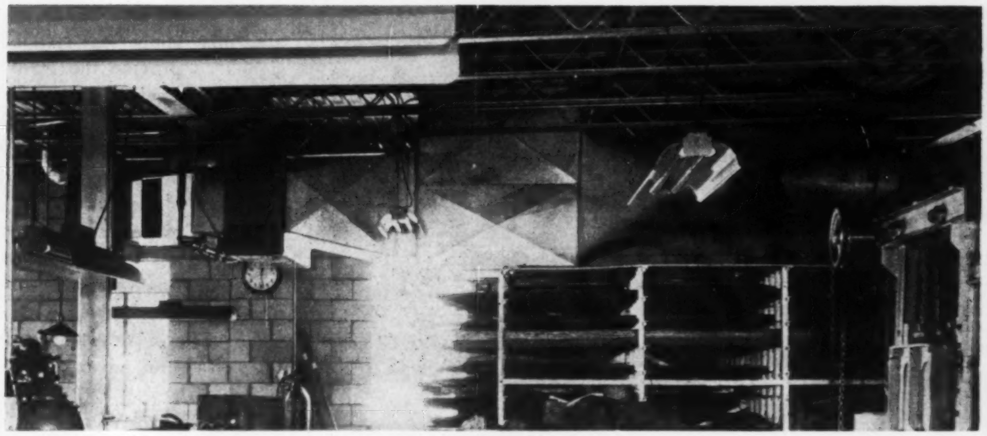
1) The negative pressures created by the exhaust system were interfering with the combustion in the unit heaters.

2) Some parts of the working areas were cold and drafty, as a result of air infiltration.

The solution of these problems was to bring in outdoor air in an amount equal to that exhausted and to heat it, using an after-mix system, with gas fired heat exchangers.

Duct Furnaces Chosen

Gas fired duct furnaces, with separate blowers sized for the installation, were selected for several reasons. The conventional gas fired unit heater with propeller fan could not supply adequate air flow for a duct system. Also, the temperature



2 TWO DUCT FURNACES — near clock — preheat recirculated air before it is mixed with outdoor air

Tempers Make-Up Air for Foundry

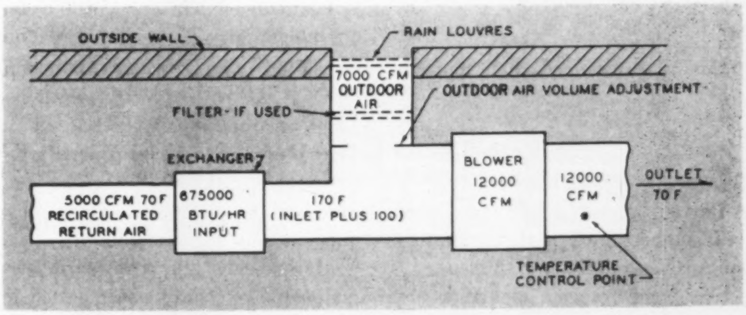
rise through propeller unit heaters is usually about 50 F, and this would result in too low a temperature of the outlet air. Further, the gas fired unit heater with a belt driven squirrel cage blower, in this particular case, was also inadequate because of limited blower capacity. Duct furnaces are especially designed to operate in heating and ventilating systems where separate air moving equipment is incorporated. They are approved for operation by the American Gas Association for an air temperature rise of 50 to 100 F above an inlet air temperature of 70 F.

Experience has proved that outdoor air, to be heated when below freezing, should not be taken directly into the heat exchanger. If this practice is permitted, the impingement of the low temperature air on the heat exchanger will likely cause condensation of the moisture in the flue gases inside the exchanger at the beginning of each cycle of burner operation. Careful consideration of these factors resulted in the selection of duct furnaces for this installation.

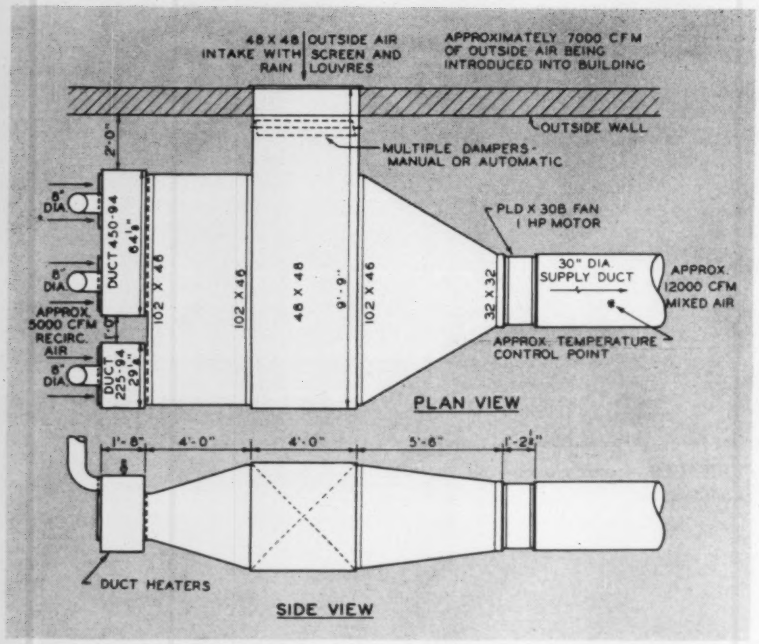
It was recognized, however, that even if the exchanger were protected, other parts of the installation would be affected by condensate "raining" over them. Therefore, a method of supplying and tempering the outdoor air, with positive assurance against any possibility of condensate formation, was designed. This method, designated as the after-mix system, is illustrated in Fig. 1. Only a portion of the total air is passed through the heat exchanger. Recirculated air is taken from the room, heated to a maximum practical temperature through the unit, and then mixed with the low temperature outdoor air in the blower and in the outlet ductwork. The outdoor air tempering thus takes place downstream of the heat exchanger.

Specifications For System

The following calculations show the basis for specifications of the recirculated air (standard density) volume, duct furnace capacity, and blower capacity in this particular



3 ONLY RECIRCULATED AIR is heated. It is then mixed with outdoor air to temper the latter before delivery via ducts


48 X 48 INTAKE WITH RAIN
OUTSIDE AIR SCREEN AND LOUVRES
APPROXIMATELY 7000 CFM OF OUTSIDE AIR BEING INTRODUCED INTO BUILDING
OUTSIDE WALL
MULTIPLE DAMPERS-MANUAL OR AUTOMATIC
2'-0"
8" DIA.
8" DIA.
8" DIA.
DUCT 450-94 64⅛"
APPROX. 5000 CFM RECIRC. AIR
1'-0"
DUCT 225-94 29⅛"
102 X 46
102 X 46
48 X 48
9'-9"
102 X 46
PLD X 30B FAN 1 HP MOTOR
32 X 32
30" DIA. SUPPLY DUCT
APPROX. 12000 CFM MIXED AIR
APPROX. TEMPERATURE CONTROL POINT
PLAN VIEW
1'-8"
4'-0"
4'-0"
5'-6"
1'-2⅛"
DUCT HEATERS
SIDE VIEW

4 CONTROL of the total heat input is maintained by a thermostat in the mixed air duct after the blower. The outdoor air inlet permits increased volume in summer with a decrease of recirculated air

installation, which necessitated replacement of 7000 cfm of air removed by the exhaust system.

The recirculated air volume was determined by using the following equation:

$$R = R_1(T_1 - T)/[T_2 - (T_1 - T_3)] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots [1]$$

where R = air to be recirculated, cfm; R_1 = outdoor air (standard density) to be tempered, cfm; T = temperature of outdoor air; T_1 = temperature of mixed air at heater discharge; T_2 = temperature rise through heater; T_3 = temperature of recirculated air.

The values for this installation are as follows:

$$R = 7000\ (70 - 0)/[95 - (70 - 70)]$$
$$= 5150 \text{ cfm}$$

Having determined that approximately 5000 cfm of recirculated air would be required, the following equation was used to determine the heater input based on an 80 percent efficiency assumption:

$$H = RSDT_h/E \quad \ldots\ldots\ldots\ldots\ldots [2]$$

where H = heater input, Btu per hr; R = cfm of recirculated air; S = specific heat, Btu per lb per F; D = density of air, lb per cu ft; T_h = temperature rise through heater; E = assumed efficiency.

$$H = (5000 \times 0.018 \times 100 \times 60)/0.80$$
$$= 675{,}000 \text{ Btu per hr}$$

The total volume of tempered air at 70 F standard density for this system is, then:

Recirculated air	5000 cfm
Outdoor air	7000 cfm
Total	12,000 cfm

The drawing in Fig. 2 shows the after-mix tempering system as designed to provide the 5000 cfm of recirculated air and 7000 cfm of outdoor air. To preheat the premixed return air, two duct furnaces were specified, one with a capacity of 450,000 Btu per hr and one with 225,000 Btu per hr. The control of the total heat input is maintained by an off-and-on control in the mixed air duct after the blower.

The after-mix system appears to possess several advantages:

1) Excessive cool air infiltration is eliminated by equalizing the pressures inside and outside the plant.

2) Sub-freezing outdoor air does not impinge directly on the heat exchanger.

3) Power requirements and blower capacity are kept at a minimum.

4) The system permits introduction of outdoor air under widely varying outdoor air temperatures without adding additional heat to the space or upsetting the heating system balance. Good diffusion of the air at the supply outlets permits relatively low air temperatures to be introduced. There is no need for readjusting the temperature controller with changes in outdoor temperature.

5) The outdoor air inlet is sized to permit the increase in volume of air in summer with a corresponding decrease of recirculated air. This is controlled by dampers in the ductwork so arranged that the blower motor is not overloaded.

6) Because the burners are operated by a single point controller in the tempered air duct, unit control problems are infrequent.

Rubber Lining Prevents Corrosion of Metal Piping

A British auto maker's experiment with rubber lined pipe is reported by the Natural Rubber Bureau.

Salt and other impurities in brackish boiling water drawn from boreholes caused corrosion right through the walls of unlined steel pipe in only eight months.

He had new piping installed, also unlined. The failure was repeated in about the same time.

Then it was decided to experiment with a rubber lined pipe. The rubber lined main, installed in 1948, after six years of constant service under the same negative conditions, is said to be in excellent condition today.

THE LAW AND YOUR PROFITS

Meeting of Minds Is Essential

. . . If clear-cut proposals are not met with clear-cut acceptances — with words and phrases in contract form establishing intention — needless litigation may arise from the resulting ambiguity.

IT IS NOT sufficient that a *proposal* for installing equipment, or for other work and materials, be crystal clear. To avoid difficulties, the *acceptance* must likewise be extremely definite. This principle is well exemplified in a recent case.

Warma-Pyper Corp. entered into a contract with the Frostirock Co. for a "new boiler installation" at Frostirock's beverage manufacturing plant. [All names herein are fictitious.] In a letter to that concern, the Warma-Pyper people outlined what equipment they would supply and install. Following a written acceptance some months later, installation was begun more than a year after the heating company's proposal. While the installation work was still in progress, Frostirock ordered Warma-Pyper to "desist," complaining that defective equipment was being put in.

Thereupon Warma-Pyper sued Frostirock for breach of contract. The beverage company counterclaimed against the heating contractor for breach of warranty. In the trial court, Warma-Pyper won a verdict for the recovery of $40,000. Frostirock, having failed in his counterclaim, appealed to the state supreme court. That tribunal saw only one subject of real contention, namely, "Item No. 6" of the offer and acceptance. Warma-Pyper in its original letter had proposed:

". . . .6. For the installation of two 'A' stokers with necessary equipment and damper control, we ask the sum of $8500.

"Alternate: For the 'B' stokers on the boilers, we ask $9500.

WILLIAM HURD HILLYER, author of this regular feature, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

"For the 'C' stokers, we ask the sum of $10,800.

"It will be noted that 'B' does not meet the guarantee requirements, and the 'C' stokers are not adaptable to boilers of the required type and size. . . . . ."

In their acceptance of August 27, Frostirock Co. referred sketchily to Item No. 6:

"Stoker Installation: with escalator clause, $8500."

Which Stoker Installation?

Whatever grief overtook the beverage company on account of this deal was traced by the supreme court to that scantily worded item "stoker installation." The judge complained that "no language dressed its purpose, no words gave clothing to its identity, no phrase established its intention." What stoker installation did Frostirock accept? The heating contractor had offered, in his letter quoted above, three distinctly different types of stokers, and the beverage company laconically replied — in effect — "We will take a stoker installation."

Inevitably, difficulties arose between parties. At the trial, oral evidence was introduced to show what it was that Frostirock had really accepted. The beverage folks protested that such evidence, being unwritten, was inadmissible for interpretation of a written contract. The supreme court judge, however, was unimpressed by this position. "The law," he declared, "does not simply stand by helplessly when parties *fail to express their full intentions* in written contracts. Two substantial business organizations do not enter into an agreement involving thousands of dollars without a *meeting of minds*. If the terms of that meeting are not clearly expressed in the formal contract, then the ambiguity must be cleared up by introduction of other evidence."

The beverage company maintained that the "stoker installation" mentioned in its written acceptance meant "A" stokers. Warma-Pyper insisted that, because of what had transpired between the original offer and its acceptance, the phrase in question meant "B" stokers.

"Only parole (spoken) evidence,"

said the court, "could clear away the fog and mist so that the jury could intelligently meet the issue." In addition, Warma-Pyper produced letters which they had written to Frostirock tending to show that, because of strike conditions at the "A" stoker plant, the beverage company had — verbally at least — ordered "B" stokers.

Saying It Is Not Enough

In such an atmosphere, the Warma-Pyper Corp. was manifestly at the mercy of "every wind and doctrine," depending upon various recollections of different people as to what was *said*. Yet the law, as judicially laid down, forced them into this position as a penalty for fostering vagueness in the relationship between parties.

Although this particular case found the heating contractor fortunate enough to encounter a jury that believed the contractor's version of conversations, rather than that submitted by the beverage maker — and to come before judges who let the verdict stand — things might just as easily have taken the opposite turn. Such an outcome would have left Warma-Pyper many thousands of dollars poorer.

If the contractor had insisted upon a clear and unequivocal acceptance, thereby achieving a complete meeting of minds before starting installation, litigation and the risk of heavy loss would have been avoided.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

QUESTION OF THE MONTH

What Maintenance Program for Valves?

THE QUESTION, *What's the Basis of a Maintenance Program for Pressure Reducing Valves?*, was published previously in HPAC and is repeated here for information along with some answers to the question that have been received. Other comments for publication will also be welcome.

"I am looking for information which might furnish a basis for an inspection, overhaul and replacement program covering 30 1 in. pipe size, pressure reducing valves, diaphragm operated, on cold water service. I would like to know how often to open the valves for inspection and about how often, on the average, it would be necessary to replace the diaphragms and the other working parts of the valves."

BILL DOPP —

"Any Valve Should Be Inspected Once a Year"

THE FIRST THING I would suggest is for the reader to call in the sales representative of the manufacturer of these valves, talk the matter over with him and accept his recommendations. That is, assuming the valves are all of one make. If they are not, select the manufacturer of the largest number, then check with one of the others. A manufacturer knows his product better than anyone else and will be happy to cooperate by keeping his product performing and providing maximum service.

Any automatic valve should be opened, cleaned and inspected, with any worn or damaged parts replaced, at least once each year. This should be done regardless of the nature of the service. In this particular case, cold water service may mean a lot of different things. Is this water clean, or does it carry silt or vegetable matter? If it does, the inspection period may have to be increased to as much as once a month. Should these valves be working in a close throttling position, they will certainly be subject to wire drawing. How much of an effect this will have depends upon whether they are double disc regulators or single disc dead end regulators. Do the valves have rubber or metal diaphragms? That again will help determine what the inspection and maintenance program should be. Are these valves all in the same kind of service, and is it continuous or intermittent?

The character of the water will also be of prime importance. Should this be distilled water, or water having traces of acetic acid, the problem may involve an investigation of the metals in the seats and discs to provide greater resistance to the corrosive effect of these fluids. Water is not just water when it is in pipe, valves and fittings.

Any maintenance program for a battery of 30 automatic valves deserves a careful study of all the factors involved. The highest authority should be consulted in developing such a program. That authority is the manufacturer who made the valves. Call him in; he will want to help you.—BILL DOPP.

W. M. DILLON —

"Make Periodic Pressure Tests on Valves"

THE LIFE of the pressure reducing valve and the quality of service that it renders is influenced by many factors. In the first place, the valve should be sized according to the load or water demand rather than by pipe size. The wear, corrosion or general deterioration of component parts, such as valve seat, discs, diaphragms, are affected by the condition of the water. Solids, such as fine grit and silt, cause excessive wear of the valve seat and disc. There are some corrosive waters that attack metals and cause porosity or deterioration of the seat face, resulting in improper functioning of the regulator. Excessive forces, which are the result of thermal expansion, may damage the seat and diaphragm, reducing the expected service life and possibly causing immediate failure. The valve oversized with respect to the water demand will be subject to wire drawing of the seat and disc.

It is almost impossible to lay down a hard and fast rule for the time between inspections. Experience in this field indicates that some valves are damaged by local conditions in less than a year and require replacement of some component parts. In other areas, valves have been in service for over 15 years without replacement of any component part.

The practical approach to this matter of preventive maintenance and repair or replacement would be to make periodic pressure tests and visual inspection of the valve. A pressure gage installed on the line in the vicinity of the pressure regulator will indicate abnormal conditions. If, when there is no water demand, the pressure creeps upward slowly, it would indicate that either the disc or the seat were worn, so that the valve would not shut off the water supply completely. Internal inspection and replacement of parts would be indicated if this was observed. However, if there is no creep in pressure, it indicates that the seat and disc are in good condition.

Let us assume that the various outlets are open for normal or average flow up to the maximum expected demand. If the pressure in the line to the outlets drops to where there is inadequate flow from the most distant one, or if the pressure drops below a value which has been noted on previous tests, it indicates that the diaphragm may be aging, becoming stiff, and does not permit the valve to open normally to demand. Or, it may be that the number of the outlets has been increased and the valve has inadequate capacity for the load. In this case, there are two things to consider. One is deterioration of the valve component parts, and the other is load expansion. The load expansion could readily be judged from the study of the original connected total load as against the existing connected load. If the demand has not been increased, the valve parts should be checked and replaced as needed.

READER ASKS —

"What's Best Way To Save Heating Fuel?"

"There are many things that can be done to save fuel required for building heating, but I wonder if it is possible to say what the one most effective method of heating fuel conservation would be? I'd be interested in any comments from readers as to what management of the 'average' small industrial plant or commercial building should look for when the possibilities of fuel conservation are being considered?"—G.N.W.

[You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.]

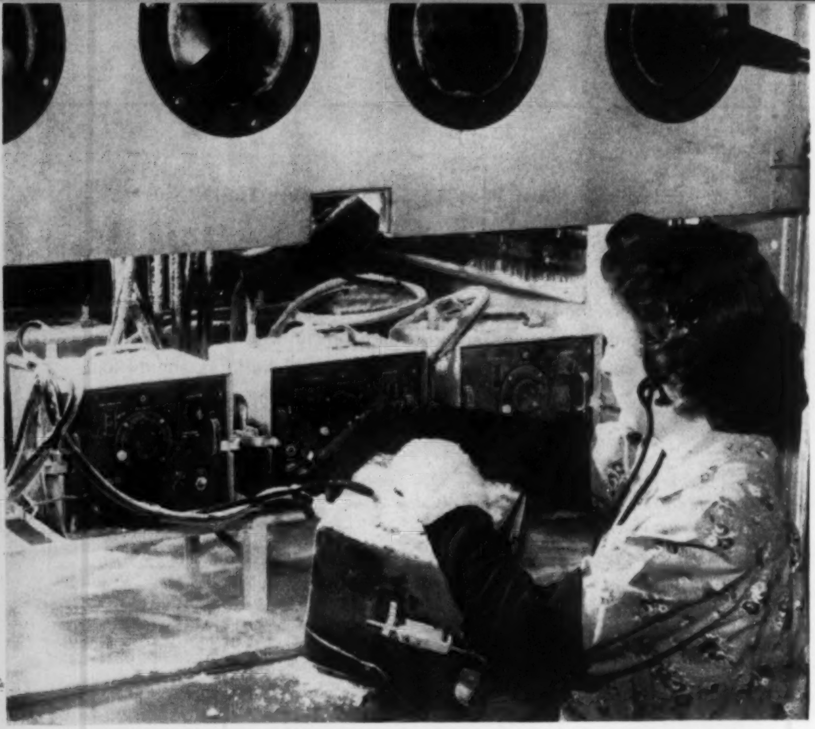
Another point to consider is the condition of the supply pipe. Over a period of time, the opening in the supply pipe to the regulator may be reduced gradually by solids adhering to the pipe walls. Eventually, this restriction would influence the pressure at the inlet of the regulator and, under normal to high demand, the pressure reaching the inlet of the valve could be lowered to the point that it would not permit the valve or regulator to pass sufficient water to maintain the proper reduced pressure in the pipes.

Periodically, the valve should be observed or inspected visually. All self-contained valves have a telltale hole in the spring housing or in the bonnet. Any water seepage through a deteriorating diaphragm would leave a deposit around this telltale hole. Discolorations would be evident, indicating that seepage is occurring in the diaphragm. Inspection by dismantling the valve is then indicated. There is the possibility, of course, that atmospheric condensation might cause some discoloration and be misleading. If there is discoloration after the valve has been in service a year or two, it would be well to examine the diaphragm before complete failure causes a stream of water from the telltale hole.

Taking a valve apart for visual inspection at regular intervals is not advisable. Often, workable parts are damaged in the dismantling process, and they are not in a condition to be reassembled. If the valves can be allowed to operate without disturbance, additional service can generally be obtained.

These comments apply to all types of water pressure regulators, whether self-contained or of the remote control type. The remote control type of valve has a body on which is mounted a yoke diaphragm chamber with an exposed spring and a packed stem, with a control pipe from the diaphragm chamber to the reduced pressure line beyond the regulator.

While only a general line of procedure can be suggested, without analyzing the experiences in an area with valves of various types, it is suggested that a planned pattern be started, based on the experiences of the individual contractors in their area. It would be a simple matter to carry a log, recording basic data on experiences. This will indicate, in a relatively short period of time, the most effective pattern for preventive maintenance. These patterns probably would be subject to alteration from time to time, as often a modification or change in the treatment of the water, or a change in the origin of water supply, will alter the conditions of the environment and the characteristics of the valve. These matters will require continuing study.—W. M. DILLON, Director of Engineering, Watts Regulator Co.



IN THE DESIGN of test rooms, the air conditioning system should be made as flexible as possible

Designing the Test Room Air Conditioning System

By F. F. Stevenson

● There are two outstanding problems in planning and installing air conditioning systems for product testing laboratories. One is to provide adequate ductwork, and the other is to prevent freezing-up of the coils. Here is how the author solves these problems, based upon his experience. His three previous articles on test room air conditioning appeared in the March, June and August 1954 issues of HPAC.

IN ONE PARTICULAR installation, defrosting was especially difficult when pulling the room down to design conditions, after it had been out of use or had been on the hot wet cycle. The coil froze up rapidly during pulldown and the intervals between defrosts had to be short, because as the coil frosted the system air flow rate dropped sharply. Even when the room was finally brought down to design conditions, the same troubles were experienced, to a lesser degree of course, but enough to make the operation unsatisfactory.

When actual tests were being conducted, a small amount of outside air was admitted on hot humid days, and this introduced a considerable moisture load to the coil. After the coil was defrosted, the residual water caused the trouble. The damage caused by it was quite extensive in the unit and the air supply duct.

The air leaving the coil was saturated and was carrying considerable entrained water, and even after the eliminator was installed, it was impossible to keep water particles out of the duct.

In theory, all of the moisture should have gone out the exhaust duct, but this condition did not exist in practice. A horizontal supply duct extended from the fan to the ceiling diffusers. The defrost exhaust riser was connected to the top of the supply duct near the fan discharge. This was a mistake. Condensation occurred and water flowed down the sides of the riser to the supply duct in both directions to the fan and to the shutoff damper in the supply duct just ahead of the reheater.

There was only one drain outlet in the supply duct, and the duct should have been properly pitched also. The proper pitch was not pro-

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Mr. Stevenson has contributed many articles to HPAC for over 15 years. He is a design engineer, who has had wide experience in heating, ventilating and air conditioning. He has been engaged in contracting work and also with several engineering and architectural offices.

vided, and it was soon discovered that two drains were needed instead of one.

Because the ductwork was not tight, the excess moisture got into the insulation, soaking it in some places. The closed damper proved to be no bar to the flow. Information on how to line damper blades to make them a 100 percent water barrier is needed for the benefit of even the most experienced contractors.

The pitch of one of the ducts was altered and the draining effectiveness was increased, but still this condition was not corrected entirely. The mistake was in the ductwork, and after the system went back to the on cycle, the supply air picked up the excess moisture and delivered it to the room. Of course, it was futile to attempt to maintain design conditions, as long as any moisture was present to be picked up.

Provide Branch Duct

A branch duct should have been provided from the supply duct, extending horizontally for a short distance and then vertically up through the roof, with an elbow on the exposed end. With the right pitch in the horizontal branch, adequate drain outlets, and two properly located and well lined shutoff dampers in the supply duct, the residual moisture trouble would have been largely eliminated.

The specifications called for tight ductwork, but it seems that such a requirement is sometimes viewed lightly and often with disastrous results. Ducts on systems like these should perhaps be soldered or welded at all joints.

Where there is a possibility that there will be a need for temperature measurement and other observations, it is always advisable to provide instrument openings well in advance. Also, it is suggested that the contractor be required to provide suitable insulated removable caps or plugs for each one. These caps must be tight fitting.

In an attempt to correct the difficulties the intervals between defrosts and time of defrosts were varied so as to secure the best balance and to prevent the freeze-up of the coils. Ice accumulated on the coils rapidly during some cycles and slowly on others. Apparently this was due to thin coatings of residual ice remaining on the coil after the defrost period. The problem was acute.

If the frequency of defrost were decreased, the air flow rate would fall off sharply because of the icing situation. On the other hand, if the frequency were increased, there would be more post defrost reactions to contend with.

The original design called for a continued period of air exhaust, after the defrosting heater was turned off and before the refrigerant was introduced to the coil. During this period, the system was expected to get rid of all the residual water and moisture of defrosting. This did not occur, even after the time of the defrost period was increased.

There was just too much water present on the coil and in the ducts, and as soon as the air supply was shunted back to the room and the refrigerant introduced to the coil, the humidity rose sharply, and it took 10 to 15 min to reduce it again. Such a pulldown period was bad, because the coil frosted rapidly at this time.

Change the Coil

After trying for several months to lick this problem, it was necessary to change the coil and substitute one with a fin spacing of 30 per ft. This ended a large portion of the defrost troubles.

The selection of a recording and controlling humidistat for this installation is also of interest. It was found that a standard humidity recorder will not register below 10 grains per lb of air. Therefore, it was decided to have a special instrument made to order, using the mechanisms of two different manufacturers. It was equipped with a sensing element, consisting of a cylinder with lithium chloride impregnated in wax between two electronic circuits. A variation in water vapor content causes a change in the minute current flowing in this circuit. The current is amplified by tubes, and it is then strong enough to actuate the recording and controlling mechanism.

The instrument was exceedingly sensitive and responsive, although it was difficult to keep in calibration. From the standpoint of recording the moisture content, it was just what the operator of the laboratory needed, but it did not function satisfactorily as a controller. The most sensitive controller will not perform satisfactorily as a modulating control when it is used with an on and off solenoid valve.

Air Weight Must Be Considered

Another factor which deserves attention is the weight of the air handled during the hot wet cycle and during the cold dry cycle. There is considerable difference in the weight of air at 100 F and at zero F, but with a draw through unit the fan must handle such variations. The fan should be powered on the basis of the heaviest air. With multi-operational rooms, it is desirable to use the same volume of air for all climatic cycles, but in some cases it may be desirable to reduce the volume when handling the heavier air. With this arrangement, a two speed motor should be used so that different air volumes may be used for each of the cycles but requiring about the same power for each.

A Large Installation

As stated before, a large laboratory does not present the problems of the small one. With the former, comparatively large volumes of air are used and equipment suitable for the work is readily available. Such a large installation comes to mind where the required humidity was low — 10 grains of water vapor per lb. However, the air volume used in this case was 10,000 cfm.

A lithium chloride liquid absorbent dehydrator was installed with a water aftercooler and no trouble was encountered at all. The installation was successful from the start and required very little adjusting. The internal latent load was moderate. Vapor barriers were installed in the walls, ceiling and floors and an air lock entrance was provided. Due to the low moisture pickup required, a considerable portion of the return air could be bypassed around the dehydrator. With a small amount of air to treat, it was possible to use a comparatively small dehydrator.

Tap water in the plant was used in the dehydrator instead of chilled water. The breakoff point of the dehydrator was right at the design leaving dew point and chilled water could be piped to it, in case it was unable to handle the load. However, all the design calculations seemed to work out and chilled water was not required. With the use of a deep coil for aftercooling and a large volume of water to give the maximum heat transfer and mean temperature difference, the system had no trouble at all in maintaining the specified conditions.

When using a liquid absorbent dehydrator, there should be no wide fluctuations in the temperature of its cooling water, to prevent the solution from getting out of equilibrium. It is well to coat the exhaust duct from the regenerating unit with a corrosion inhibitor. This duct should also have a drainage connection.

A Small Test Room

A small test room comes to mind where it was necessary to maintain a dry bulb temperature of 73 F and 50 percent R H, but due to the nature of the materials tested in the laboratory, there was a humidity loss instead of a gain. A cooling load existed during a considerable part of the time, and even with a low split between the space temperature and the supply air temperature, a supply air dry bulb temperature of 58 F was required. A deep coil was used, and the air leaving the coil was about 95 percent saturated, but the moisture content was too low to hold the desired humidity level. The dry bulb and dew point temperatures of the supply air were raised and the air flow rate was increased to the maximum possible, but it was impossible to meet and maintain the desired humidity condition.

There were several electric heaters in the room — the usual type found in a laboratory — and these helped to solve this problem in a makeshift fashion. The time of greatest humidity loss occurred when fresh material was brought into the room to be tested. Therefore a large pan of water was placed on one of the heaters prior to the start of the test and the water let boil very slowly for several hours. Of course, a steam heated pan type humidifier or a steam grid could have been installed in the room, but this arrangement worked satisfactorily at less cost.

How Much Water Vapor?

In testing rooms where the control of humidity is an important factor, it is desirable to determine the weight of water vapor present in the room at design conditions, as this value together with the amount of moisture gained or lost per hour, is necessary to calculate the condition of the supply air. Take, for instance, a room with a volume of 1040 cu ft and held at a saturated dry bulb temperature of 110 F. The room will contain about 72 lb of dry air. At 110 F and saturated, each pound of dry air will contain 1.36 cu ft of water vapor. Therefore, 72 lb of dry air at this condition will contain 72 × 1.36 or 98 cu ft of water vapor. As the room volume is fixed at 1040 cu ft, and the 72 lb of dry air completely fills this space, it is obvious that the room cannot contain 72 lb of dry air plus 98 cu ft of water vapor, with the space pressure remaining practically constant.

A quick way of determining the approximate volume of each, without going into involved mathematical calculations, is to take the ratio of the volume of water vapor to the cubical content of the room, which was about 9 percent and deduct this percentage from the weight of the dry air. This method indicated that the room in question contained about 66 lb of dry air and about 90 cu ft of water vapor. In this case, calculations showed that the moisture content would be approximately 4 lb or 28,000 grains. Of course, if charts indicating grains per lb of dry air at various conditions of temperature and humidity are available, they may be used.

Knowing the weight of the moisture content of the room and the humidity loss, also by weight, it is easy to determine the moisture content of the supply air.

In this installation, a small refrigeration machine was used without capacity controllers. In order to maintain a stable evaporator pressure on low loads, a back pressure valve — air compensated — was used, so that as the demand for cooling became satisfied, the pneumatic control would reset the evaporator pressure at a higher level. This resulted in long running cycles of the machine at low suction pressure. This was not so desirable from the standpoint of the capacity of the compressor, but long running cycles in such applications are a must, regardless of other considerations. In fact, some installations are designed to have the refrigeration compressor operate constantly with hand control, using a back pressure valve to prevent over cooling or dehumidifying.

It is recommended that in the design of the test rooms, the system should be made as flexible as possible. Before installing the equipment, it is suggested that a note be made of the various items which may have to be changed or altered. Also, it is advisable to provide means for making such changes as economically and as simply as possible.

SAM LEWIS' PAGE

Our Tools “Instruments of Service”

A BELOVED old architect called the equipment and tools we have available our “instruments of service.” They are useful to engineers as well as to architects. Their development seems to run in cycles. Some device becomes popular, then we find some new scheme that seems to eclipse the present one.

Many years ago, an overfire stoker that sprayed the cold coal in small particles over the hot fuel bed was used in a large — for that time — electric generating plant. Other types of coal burners superseded this coal-thrower, but eventually it reappeared as a modern spreader stoker.

• • •

The fireplace used to be used quite extensively to heat the bungalow house. Every fireplace has to have a chimney. I remember the old Palmer House hotel, in Chicago, with its flock of fireplace chimneys. Fireplaces were poor heating plants until Benjamin Franklin invented a cast iron enclosure for a fireplace and presented the design to the public. This Franklin stove was a revolutionary improvement.

• • •

The main steam supply pipes for tower-like buildings have often been placed in the attic with branches that drained down through all the intermediate stories to condensate pipes in the basement. These vertical pipes sometimes present a problem. There are installations in which each story has a separate main horizontal pipe above the corridor ceiling, thus eliminating many vertical risers.

SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. His 50 years of service in heating, ventilating and air conditioning were marked last month by his fellow-engineers.

• • •

Continually we have to retell the architects, who would deprive us of a boiler room window, that a candle trying to burn in the bottom of a tumbler or cup will not burn if the top of the enclosure shall be covered.

• • •

We frequently encounter a brick chimney that has three sides exposed to the weather, while the fourth side is part of the warm building wall. The cold sides contract while the warm side expands. Mortar falls out of the joints on the cold sides and sometimes the top of the chimney above the roof tends to tip away from the warm side. Hotels and apartment buildings that have the chimney freestanding outside the main walls have little trouble on that score.

• • •

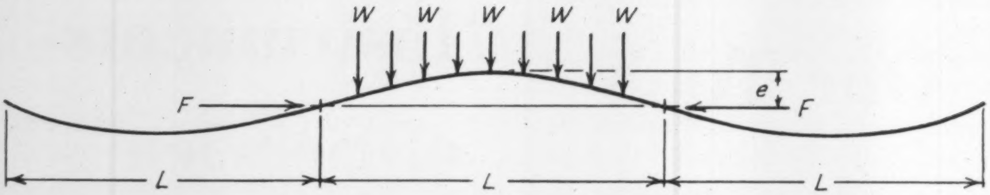
Long ago, engineers employed a warm liquid for carrying heat through pipes to radiators, but the thermally circulated slow moving water required pipes that became excessively large in diameter. With the advent of universal electric power, the hydraulic heat distribution scheme with a heated liquid and with very small pipes and tubing, and with electric pumps, reached its present popularity.

• • •

There is a tendency for builders to lay down flat slabs at ground level and to erect structures on the slabs. The engineer thus has no basement or other channel for conductors of heat or electric power or lights or telephones. Need is felt for underfloor access ducts or their equivalent.

• • •

Repeatedly in existing buildings the installation of a cooling system is delayed or abandoned because the electric wiring cannot carry the added load. In one tall office building, the facilities, from sewers in the street to water mains in the basement, transformers and conduits, all were so inadequate as to defeat the desired cooling of even one story.



1 THE SNAKED pipe line has forces acting on it like this, causing it to act as a column and an arch

Calculating Forces Due to a "Snake" of Piping

By E. R. Ketchum
Mechanical Engineer

A LONG PIPE LINE lying on the ground, unrestrained except perhaps at the ends, will weave back and forth or "snake" to relieve the compressive stresses set up by thermal expansion. The snake follows a definite pattern in addition to a certain amount of indefinite movement.

Analysis of the forces causing the snake shows that, in resisting the movement due to expansion, the pipe acts both as a column and as an arch or curved beam with a uniform load equal to the friction of the pipe on the ground. During contraction, the column action tends to straighten the pipe, while the friction resists such straightening.

The snake should be stable, and the natural shape should be assumed with a minimum total force.

The equations for the forces are:

$$F_c = \pi^2 EI/l^2 \quad \ldots\ldots (1)$$

$$F_b = wl^2/8e \quad \ldots\ldots (2)$$

Equation No. 1 is Euler's column formula, and Equation No. 2 is for an arch or curved beam where F_b = curved beam force, lb; F_c = column force, lb; F_T = total force, lb; I = moment of inertia of pipe, in.^{4}; E = modulus of elasticity, lb/in.^{2}; e = eccentricity, in.; l = length of bow (½ cycle), in.; L = length of bow (½ cycle), ft; w = beam load, lb/in.; W = beam load, lb/ft.

The total force during expansion

$$F_T = F_b + F_c \quad \ldots\ldots (3)$$

$$\text{or } F_T = (wl^2/8e) + (\pi^2 EI/l^2) \quad \ldots\ldots (4)$$

Differentiating to find minimum

$$dF_T/dl = (2wl/8e) - (2\pi^2 EI/l^3) \quad \ldots\ldots (5)$$

Therefore, for minimum total force

$$l=\sqrt[4]{\frac{8\pi^2 eEI}{w}} \quad \text{-------------} (6)$$

Substituting the above value of l in the beam force,

$$F_b=\frac{wl^2}{8e}=\frac{w\sqrt{\frac{8\pi^2 eEI}{w}}}{8e} \quad \text{-------------} (7)$$

And in the column force,

$$F_c=\frac{\pi^2 EI}{l^2} \quad \text{-------------} (8)$$

$$=\frac{\pi^2 EI}{\sqrt{\frac{8\pi^2 eEI}{w}}} \quad \text{-------------} (9)$$

$$=\frac{w\sqrt{\frac{8\pi^2 eEI}{w}}}{8e} \quad \text{-------------} (10)$$

Therefore, the total force F_T is minimum, when

$F_b = F_c$ ....(11)

The natural length of the bow is

$$l=\sqrt[4]{\frac{8\pi^2 eEI}{w}} \quad \text{-------------} (12)$$

Or converted to a more convenient form, with L = length in ft and W = weight in lb/ft.

$L^4 = 1.33 \times 10^6 eI/W$ ....(13)

This is plotted in Fig. 2.

Since the force on the arch or beam is infinite when the eccentricity is zero, a small definite eccentricity must be assumed for a practical solution.

The maximum force when the pipe is expanding is

$F_T = F_b + F_c$ or $2F_c$ since $F_b = F_c$ (14)

Therefore,

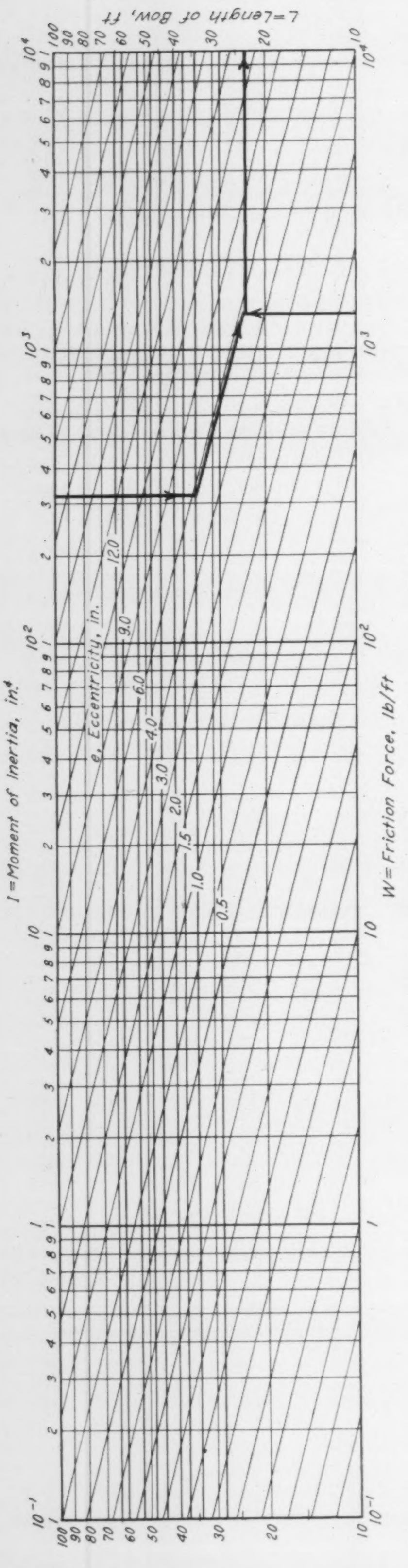
$F_T = 3.974 \times 10^6 I/L^2$............(15)

This is plotted in Fig. 3.

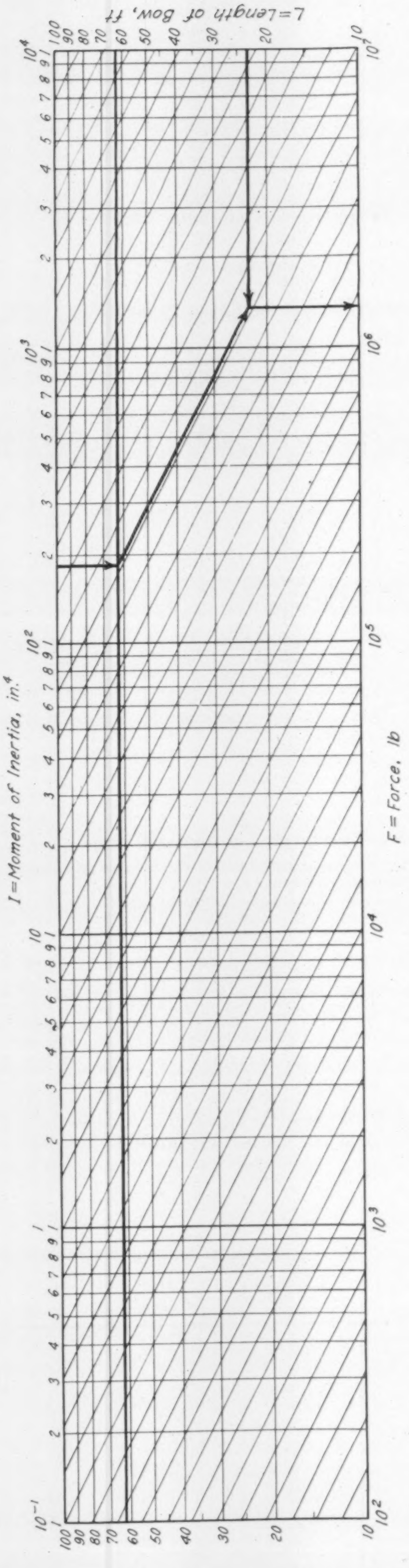
Table 1 shows the length of bow and forces necessary to cause snake in a pipe full of water lying on the ground or on closely spaced skids.

TABLE 1—THE LENGTH OF BOW and forces necessary to cause snake in a pipe full of water lying on the ground is assumed or on closely spaced skids is given here. A coefficient of friction of 0.50, and an initial eccentricity of 1 in.

Pipe								
Nominal size in.	Wall Thickness	Metal area in.^{2}	Load, W, lb/ft^2	Moment of inertia, I, in.^{4}	Length of bow, L, ft	Force to start bow, F_T, Kips	Temp. diff. to start bow, F	Force to develop 20 Kip metal stress Kips
2	Sch. 40	1.074	2.553	0.666	24.2	4.5	22.2	21.5
3	Sch. 40	2.228	5.39	3.02	29.2	14.2	33.8	40.6
4	Sch. 40	3.17	8.155	7.23	34	27.8	46.4	63.4
6	Sch. 40	5.58	15.74	28.1	39.3	73	69.2	111.6
8	Sch. 40	8.40	25.13	72.5	44.0	150	94.5	168
10	Sch. 40	11.91	37.35	160.8	48.8	270	120	238
12	Sch. 40	14.58	49.3	279	52.8	400	145	292
14	⅜ wall	16.05	57.45	373	54.3	490	162	321
16	⅜ wall	18.41	70.8	562	57	680	195	368
18	⅜ wall	20.76	85.8	807	59.2	915	234	415
20	⅜ wall	23.12	102	1114	62	1130	258	462
24	⅜ wall	27.8	139	1943	66	1760	334	556
30	⅜ wall	34.9	205	3833	71	2650	402	698
36	⅜ wall	43.6	282	6715	74	4780	581	871



2 THIS REPRESENTS the equation $L^4 = 1.33 \times 10^6\ eI/W$



3 THIS REPRESENTS the equation $F_1 = 3.974 \times 10^6\ I/L^2$

HEATING, PIPING & AIR CONDITIONING

AMERICAN SOCIETY OF
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A Theoretical and Experimental Study of Liquid-to-Liquid Heat Transfer in Hot Water Heaters

By F. W. Hutchinson*, Berkeley, Calif., L. J. LaTart**,
and N. W. Smith**, Rome, N. Y.

SUMMARY — Based on an experimental investigation of water-to-water heat transfer, it was found that the empirical equations commonly used for turbulent flow within a tube and for free convection outside the tube permit evaluation of film coefficients, hence of the overall coefficient of heat transfer, which agrees — within the limits of experimental error — with the values obtained by test under conditions simulating those existing within a water heater. Further, the demonstrated major influence of the outside thermal resistance is such that a reasonably accurate approximate correlation can be obtained between water-to-water mean temperature difference and rate of heat transfer. The approximate correlation — accurate to within better than 10 percent for the greater part of its range — is valid over a temperature range from 86 F to 186 F, a velocity range from 3 to 6 gpm (in ½-in. or ⅝-in. nominal diameter copper tube), and is applicable to various tube wall thicknesses.

Where accuracy greater than that of the correlation curve is required the theoretical relationships can be applied; similarly, for ferrous pipe or alloy tubes the theoretical relationships permit correction of the experimental data to obtain design values of the rate of heat transfer.

THE INTENT of this research paper is to present experimental data on the quantitative evaluation of the heat transfer characteristics of water heaters in which transfer occurs from unagitated hot water to-and-through a tube wall to cooler water which is in forced circulation within the tube. In its broadest thermal characteristics the system is one which approaches classification as a liquid-to-liquid heat exchanger with natural convection controlling the film resistance on the outside of the tube and forced convection determining the film resistance on the inside; in most instances, as will be shown, the thermal resistance of the tube wall will be so small as to have no appreciable influence on the overall results (except insofar as the thickness of the wall alters the inside and outside areas of the transfer surface).

The paper reviews the semi-rational, dimensionless, empirical equations which seem applicable to the system and compares — by numerical example — the value of the overall coefficient of heat transfer obtained from application of the equations with that value obtained by computation from experimental data realized from the test set-up used for the experimental work. The test set-up is described in detail and comparative test data are given for a single tube operating under controlled conditions with variable flow rates, and with varying liquid-to-liquid temperature differences.

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Theoretical Relationships

The system in question is simplified to involve transfer to a single tube of length sufficient to offset end effects, the tube being horizontal in a tank of hot water which is maintained at a practically fixed temperature without appreciable movement other than that due to thermal currents resulting from the transfer of heat; water within the tube undergoes temperature rise while traveling at a velocity sufficient to assure turbulent flow. Under these conditions heat transfer from the hot water in the tank to the cooler water within the tube would occur through a series path consisting of three thermal resistances: (1) outside film where the resistance would be controlled by the mechanism of free convection, (2) tube wall where the resistance would be controlled by the mechanism of conduction, (3) and inside film where the resistance would be controlled by the mechanism of forced convection.

The equation expressing rate of heat transfer from tank water to tube water would be

$$\begin{aligned} q &= UA_o(t_t - t_w) \\ &= [A_o(t_t - t_w)]/[(A_o/h_iA_i) \\ &\quad + (LA_o/kA_m) + (1/h_o)] \quad \ldots\ldots\ldots\ldots\ldots(1) \end{aligned}$$

where

q = rate of heat transfer, Btu per hour.
t_t = temperature of the hot water within the tank, Fahrenheit degrees.
t_w = mean temperature of the water within the tube, Fahrenheit degrees.
A_o = outside surface area of the length of tube through which heat transfer occurs, square feet.
A_i = inside surface area of the length of tube through which heat transfer occurs, square feet.
A_m = mean area, in direction of heat transfer, of the length of tube through which heat transfer occurs, square feet.
k = thermal conductivity of the tube wall, Btu per (hour) (square foot) (Fahrenheit degree per foot).
L = thickness of the tube wall, feet.
h_i = inside film coefficient of heat transfer, Btu per (hour) (square foot) (Fahrenheit degree).
h_o = outside film coefficient of heat transfer, Btu per (hour) (square foot) (Fahrenheit degree).
U = overall coefficient of heat transfer (expressed in terms of outside surface area), Btu per (hour) (square foot) (Fahrenheit degree).

$$= 1/[(A_o/h_iA_i) + (A_oL/kA_m) + (1/h_o)] \quad \ldots\ldots\ldots\ldots\ldots(2)$$

For turbulent flow within the tube the recommended[1] relationship among the three controlling dimensionless parameters for determination of the inside film coefficient, h_i, is

$$(h_iD_i/k) = 0.023(D_iV\rho/\mu)^{0.8} (c_p\mu/k)^{0.4} \quad \ldots\ldots\ldots(3)$$

The relationship recommended[1] for use in calculating the free convection value of the outside film coefficient, h_o, is

$$\frac{h_oD_o}{k_f} = 0.53\left[\left(\frac{D_o^3\rho_f^2\beta g\Delta t}{\mu_f^2}\right)\left(\frac{c_p\mu_f}{k_f}\right)\right]^{0.25} \cdots\cdots(4)$$

In Equations 3 and 4 the terms not previously defined are:

D_i and D_o = inside and outside tube diameters, feet.
V = fluid velocity within the tube, feet per hour.
ρ and ρ_f = fluid densities at, respectively, the mean temperature of the water within the tube and the mean temperature of the outside film.
β = coefficient of volumetric expansion, cubic feet per cubic foot.
g = acceleration due to gravity, feet per (hour)^2.
μ and μ_f = absolute viscosity at, respectively, the mean temperature of the water within the tube and the temperature of the outside film, pounds per (foot) (hour).
c_p = specific heat of water at the temperature in question.
Δt = temperature difference across the outside film, Fahrenheit degrees.

Test Conditions: Equations 2, 3, and 4 permit determination of a theoretical value of the overall coefficient of heat transfer for a given system once the tube is specified with respect to size and material, the inside velocity is known, and the temperature relationships for the system have been specified. The physical properties of the fluid (ρ, μ, k, c_p, β) are all either functions of fluid temperature or are independent of temperature; hence, their values can be readily fixed when the mean fluid temperature is known.

For the particular test investigated here the test section consisted of a four-foot length of ½-in. outside diameter copper tube with wall thickness of 0.028 in. and thermal conductivity of 220 Btu/(hr) (sq ft) (F deg/ft). The actual inside diameter was 0.444 in. and the outside diameter, 0.500 in. From tables for this standard tube it is noted that the capacity per foot of length is 0.008 gal. During the test the flow rate (obtained by a meter which had been calibrated with a weighing tank) was held constant at 3 gpm; the fluid velocity was therefore 3/0.008 or 375 fpm, which, in basic units, is 22,500 ft/hr.

After sufficient time had been allowed for the system to reach equilibrium, readings were taken at 2-min intervals over a 16-min test period. The temperatures of water entering and leaving the test section remained constant throughout this period at 20.70 C entering and 22.60 C leaving. The temperature of the water within the tank and surrounding the single tube varied approximately 0.1 deg with time and position, the average value being 57.73 C. Averaging and converting the Centigrade degrees experimental readings to Fahrenheit degrees, it follows that the mean temperature of water within the tube, t_w, was 71 F and the mean temperature of the water in the tank, t_t, was 135.9 F.

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[1] Heat Transmission, by W. H. McAdams (McGraw-Hill Book Co., Inc., 2nd ed., 1942).

For a mean water temperature of 71 F the corresponding values of the physical properties are: density, ρ, of 62.2 lb/cu ft; viscosity, μ, of 0.965 centipoises which equals 2.42(0.965) or 2.335 lb/(ft) (hr); thermal conductivity, k, of 0.344 Btu/(hr) (sq ft) (deg/ft); specific heat, c_p, of 1.0 Btu/(lb) (deg).

Theoretical Determination of the Overall Coefficient: To determine the inside film coefficient for forced convection it is desirable to first evaluate the term of Equation 3 which corresponds to the Reynolds Number (since this term establishes the conditions of flow):

$$\begin{aligned}\text{Reynolds Number} &= D_i V \rho / \mu \\ &= (0.444/12)\ (22500)\ (62.2)/2.335 \\ &= 22200\end{aligned}$$

The next step is evaluation of the Prandtl Number:

$$\begin{aligned}\text{Prandtl Number} &= c_p \mu / k \\ &= (1.0)\ (2.335)/0.344 \\ &= 6.79\end{aligned}$$

The Nusselt Number, appearing as the term of the left of Equation 3, is

$$\begin{aligned}\text{Nusselt Number} &= h_i D_i / k \\ &= (h_i)\ (0.444/12)/0.344 \\ &= 0.023\ (22200)^{0.8} (6.79)^{0.4} \\ &= 0.023\ (3000)\ (2.15) \\ &= 148.4\end{aligned}$$

The inside film coefficient, h_i, is then

$$\begin{aligned}h_i &= (k/D_i)\ (148.4) \\ &= [(0.344)/(0.444/12)]\ (148.4) \\ &= 1380\ \text{Btu/(hr) (sq ft) (F deg)}\end{aligned}$$

Calculations of the outside film coefficient require evaluation of the Grashof Number (the first bracketed term on the right side of Equation 4) and of the Prandtl Number, both dimensionless parameters to be evaluated with physical properties at the mean temperature of the outside film. But the thermal resistance for free convection through the outside film would be expected to greatly exceed the series resistances for forced convection through the inside film and for conduction through the tube wall. Hence, the greater part of the water-to-water temperature drop will occur in the outside film and the mean film temperature can therefore be taken, for a first approximation, as halfway between the temperature of water in the tank and the mean water temperature in the tube; the mean film temperature, t_f, is thus equal to $(135.9 + 71)/2 = 103.5$ F. Values of the fluid properties at this temperature are: density, ρ_f, of 61.9 lb/cu ft; viscosity, μ_f, of 0.648 centipoises or 1.568 lb/(ft) (hr); thermal conductivity, k_f, of 0.360 Btu/(hr) (sq ft) (F deg/ft). The value of the coefficient of volumetric expansion, ρ, is $0.115(10)^{-3}$ and of the acceleration due to gravity, g, is $4.17(10)^8$ ft/(hr)^2. The mean temperature difference between the heating and cooling fluids is $135.9 - 71 = 64.9$ F and this is approximately (refer to following section, *Corrected Theoretical Coefficient*) equal to the temperature difference, Δ_t, across the outside film.

Then evaluating the Grashof Number,

$$\begin{aligned}\text{Grashof Number} &= (0.500/12)^3\ (61.9)^2\ (0.115)\ (10)^{-3}\ (4.17)\ (10)^8\ (64.9)/(1.568)^2 \\ &= 351.500 \\ &= 0.351\ (10)^6\end{aligned}$$

The Prandtl Number, for outside film conditions, is

$$\begin{aligned}\text{Prandtl Number} &= c_p \mu_f / k_f \\ &= (1.0)\ (1.568)/(0.360) \\ &= 4.36\end{aligned}$$

Then substituting into Equation 4 to obtain the Nusselt Number applicable to the outside film,

$$\begin{aligned}\text{Nusselt Number} &= 0.53\ [(351{,}500)\ (4.36)]^{0.25} \\ &= 0.53\ (35.15) \\ &= 18.65\end{aligned}$$

The resultant value of the outside film coefficient is

$$\begin{aligned}h_o &= (k_f/D_o)\ (18.65) \\ &= 18.65\ (0.360)/(0.500/12) \\ &= 161.2\ \text{Btu/(hr) (sq ft) (F deg)}\end{aligned}$$

The overall coefficient can now be calculated by Equation 2, noting that ratios of tube diameters in inches are equal to ratios of surface areas in square feet, (and taking the mean tube diameter as the arithmetical average of inside and outside diameters).

$$U = \cfrac{1}{\cfrac{0.500}{(0.444)(1380)} + \cfrac{(0.500)(0.28/12)}{(0.472)(220)} + \cfrac{1}{161.2}}$$

$$\begin{aligned}&= 1/(0.000817 + 0.0000112 + 0.00620) \\ &= 1/0.007028 \\ &= 142.2\ \text{Btu/(hr) (sq ft) (F deg)}\end{aligned}$$

Note that the reciprocal of the overall coefficient is the total resistance and the three individual additive terms which make up the total resistance are the resistances of, respectively, the inside film, the tube wall, and the outside film; all resistances are evaluated, as is the overall coefficient, in terms of unit area of the outside surface of the tube.

Corrected Theoretical Coefficient: The given theoretical evaluation of

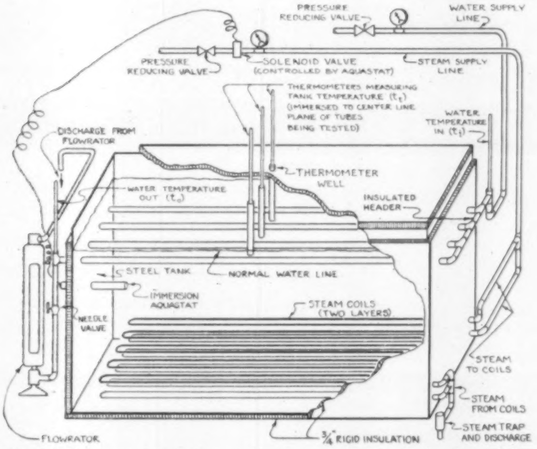
PRESSURE REDUCING VALVE
WATER SUPPLY LINE
PRESSURE REDUCING VALVE
SOLENOID VALVE (CONTROLLED BY AQUASTAT)
STEAM SUPPLY LINE
THERMOMETERS MEASURING TANK TEMPERATURE (t_t) (IMMERSED TO CENTER LINE PLANE OF TUBES BEING TESTED)
WATER TEMPERATURE IN (t_i)
DISCHARGE FROM FLOWRATOR
THERMOMETER WELL
WATER TEMPERATURE OUT (t_o)
INSULATED HEADER
STEEL TANK
NORMAL WATER LINE
IMMERSION AQUASTAT
STEAM COILS (TWO LAYERS)
NEEDLE VALVE
STEAM TO COILS
STEAM FROM COILS
STEAM TRAP AND DISCHARGE
FLOWRATOR
3/4" RIGID INSULATION

Fig. 1—Arrangement for testing water-to-water heat transfer under conditions of free convection outside the tubes

the overall coefficient was based on the assumption that the entire water-to-water temperature drop occurred through the outside film. But the actual temperature drop through the outside film is to the water-to-water temperature drop as the outside film resistance is to the total thermal resistance. The resistances were determined in the above section; hence a more accurate approximation to the drop through the outside film is obtainable:

$$\begin{aligned}\text{Film temperature drop} &= (64.9)\ (0.00620)/(0.007028)\\ &= 57.2\ \text{F}\end{aligned}$$

Noting that the one-quarter power of the film temperature drop enters into the evaluation of h_o, a corrected value of the outside film coefficient is

$$\begin{aligned}h_o &= 161.2\ (57.2/64.9)^{0.25}\\ &= 156.4\end{aligned}$$

The resistance of the outside film then becomes $1/156.4 = 0.00639$ and the corrected value of the overall coefficient is

$$\begin{aligned}U &= 1/(0.000817 + 0.0000112 + 0.00635)\\ &= 1/0.007218\\ &= 138.5\ \text{Btu/(hr) (sq ft) (F deg)}.\end{aligned}$$

Based on the new value of the outside film resistance a third approximation gives:

$$\begin{aligned}\text{Film temperature drop} &= (64.9)\ (0.00639)/(0.007218)\\ &= 57.5\end{aligned}$$

and the corrected outside film coefficient is

$$\begin{aligned}h_o &= 161.2\ (57.5/64.9)^{0.25}\\ &= 156.5\end{aligned}$$

This value differs inappreciably from the h_o determined from the previous approximation, 156.4; hence the overall coefficient obtained from the second approximation, 138.5 Btu per (hr) (sq ft) (F deg), can be accepted as the most accurate value obtainable from the given equation.

Experimental Determination of the Overall Coefficient: It has already been noted that under test conditions the water flowing through the 4-ft length of tube underwent a temperature rise, $(\Delta t)_h$, from 20.7 C to 22.6 C, or gained 3.42 F deg. Flow rate was 3 gpm, so the total energy transfer amounted to:

$$\begin{aligned}Q &= Wc\ (\Delta t)_h\\ &= (3)\ (8.345)\ (1)\ (3.42)\\ &= 85.6\ \text{Btu/min}\ \ldots\ldots\ldots\ldots (5)\end{aligned}$$

But the test section having 0.500-in. diameter has 0.131 sq ft of outside surface per foot length; the rate of heat transfer is therefore:

$$\begin{aligned}q &= 60\ (Q)/(4)\ (0.131)\\ &= (60)\ (85.6)/(4)\ (0.131)\\ &= 9800\ \text{Btu/(hr) (sq ft)}\end{aligned}$$

Then substituting into Equation 1,

$$\begin{aligned}q &= UA_o\ (t_t - t_w)\\ &= 9800\\ &= U\ (1)\ (135.9 - 71)\\ &= 64.9U\end{aligned}$$

giving

$$U = 151.0\ \text{Btu/(hr) (sq ft) (F deg)}.$$

Comparison of Theoretical and Experimental Results: The calculated value, 138.5 Btu/(hr) (sq ft) (F deg), of the overall coefficient of heat transfer differs from the experimental value, 151.0 Btu/(hr) (sq ft) (F deg), by slightly more than 8 percent. This result shows that the equations for calculating the inside and outside film coefficients can be expected to give results of the correct order of magnitude. This fact demonstrates the possibility of accurately extrapolating limited experimental results for water heaters over a range of diameters, inside fluid velocities, and mean fluid temperatures.

Experimental Procedure

Fig. 1 illustrates diagrammatically the equipment arrangement used for the experimental work. The insulated chamber permitted use of a 48-in. straight length of each of the four test tubes which are located near the top of the chamber. The tubes could be tested as a group or, by means of control valves (not shown) on the discharge side, could be tested individually. Water supply to the units under test was from the city water system, the flow rate being accurately maintained at a fixed value by fixed setting of the inlet pressure reducing valve and controlled setting of the needle valve on the discharge side. Flow rate was measured by means of a weighing tank-calibrated flow meter as shown. The water within the tank was maintained at a fixed temperature during each test. Heat to the tank was supplied by two sinuous coils located near the bottom of the tank, one above the other; each coil has ten rows of 7/8-in. outside diameter copper tube, 2½-in. center-to-center, 45½-in. long between return bends; the lower coil is 1½-in. above the bottom of the tank and the upper coil, 1½-in. above the lower.

As heat flows from the hot tank water to the cooler water within the test tubes it is evident that circulation of the water within the tank will occur by free convection as a result of the vertical variation in density. One major purpose of the study was to determine whether or not the degree of circulation was sufficient to invalidate application of the basic (Equation 4) relationship for free convection. No agitation was provided for the tank water, but by observation the degree of circulation would be expected to increase as some function of the rate of heat transfer.

Experimental Results

Fig. 2 summarizes the experimental data obtained from some 130 tests of two diameters (and two wall thicknesses) of copper* tube. Each test was run at fixed tank temperature and at fixed flow rate; variation in tank temperature among the tests was over the range from 86 F to 186 F; variation in flow rate among the tests was from 1 to 6.4 gpm.

In seeking a correlation of the experimental data it would be expected (by observation of the terms in Equations 1, 2, 3, and 4) that three variables would require consideration.

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*Although all tests were run using copper tube, the results can be readily applied to ferrous pipe or to alloy tubes by correcting the tube wall resistance; the procedure for separating the three thermal resistances of the system is demonstrated in the example given in the section, Theoretical Relationships.

1. Temperature of water within the tube and within the tank and mean temperature difference from water-to-water.
2. Diameter and wall thickness of tube.
3. Velocity of water within the tube.

But consideration of the example given in the section, Theoretical Relationships, will show that the thermal resistance due to the outside free convection film accounts for ($100 \times 0.00639/0.007218$) 73 percent of the total thermal resistance of the system. For tube velocities higher than that of the example (3 gpm) the percentage would exceed 73 percent; whereas for lower velocities the inside film would have increased significance. Thus the rate of heat transfer would be expected to be largely controlled by the factors which determine the outside film coefficient.

Referring to Equation 4, note that the diameter—a fraction—enters in the third power, hence will have small influence on h_o. Over the usual temperature range the variation in one quarter power of the various physical characteristics will not be great. Thus it follows that the major variable which would be expected to influence the outside film is the water-to-water temperature difference. Then, for velocities between 3 and 6 gpm, a rough correlation might be expected between rate of heat transfer and water-to-water temperature difference, neglecting actual water temperatures, tube diameter, tube wall thickness, and velocity of water within the tube; Fig. 2 presents such a correlation.

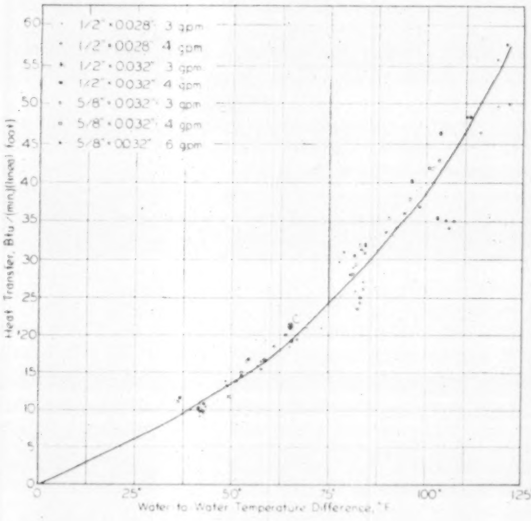

Fig. 2—Relation between water temperature difference and heat transfer rate resulting from experimental study

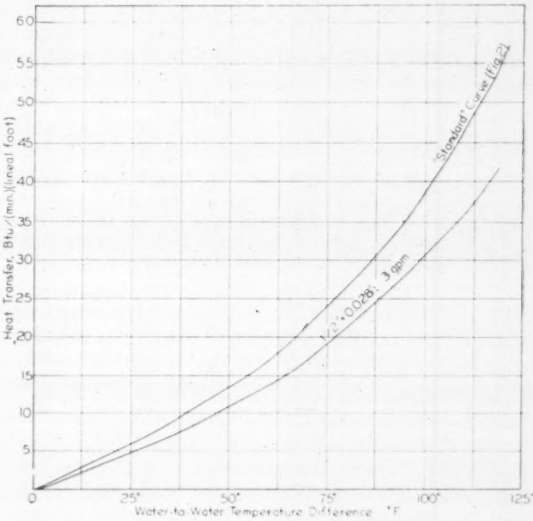

Fig. 3—Standard curve from experimental data of Fig. 2 relative to the curve for ½-in. OD tube at 3 gpm

In interpreting Fig. 2 it should be remembered that the experimental points would not be expected to fall on a single curve; hence departures are frequently due to differences in velocity, temperature, or tube type. The point identified by the letter *C* is the one which was checked by the theoretical method of the preceding section; where accuracy in design requires, other points can be readily checked by the same method. The significance of the curve indicated in Fig. 2 resides in its usefulness as a means of obtaining a rapid and simple approximation to heat transfer rates in water-to-water heaters with external free convection.

Fig. 3 presents the curve of Fig. 2 together with a similar curve for ½-in. outside diameter (0.028-in. wall thickness) tube with inside velocity of 3 gpm.

Conclusion

Based on an experimental investigation of water-to-water heat transfer it is found that the empirical equations commonly used for turbulent flow within a tube and for free convection outside the tube permit evaluation of film coefficients, hence of the overall coefficients of heat transfer, which agree — within the limits of experimental error — with the values obtained by test under conditions simulating those existing within a water heater. Further, the demonstrated major influence of the outside film thermal resistance is such that a reasonably accurate approximate correlation can be obtained between water-to-water mean temperature difference and the rate of heat transfer. The approximate correlation — accurate to within better than 10 percent for the greater part of its range — is valid over a temperature range from 86 F to 186 F, a velocity range from 3 to 6 gpm (in ½-in. or ⅝-in. outside diameter copper tubes) and is applicable to various tube wall thicknesses.

Where accuracy greater than that of the correlation curve is required, the paper shows that the theoretical relationships can be applied; similarly, for ferrous pipe or alloy tubes the theoretical relationships permit correction of the experimental data to obtain design values of the rate of heat transfer.

THE PRESIDENT'S PAGE

Long-Range Planning

The Society has now passed its sixtieth year and the accomplishments and growth of the Society and of the heating and air-conditioning industry during this sixty-year period are a matter of history.

We cannot turn back the clock, but we can examine past history to determine the cause of the failures as well as the successes in planning for the future.

One thing is quite clear. The formation of the Society, its growth, and its accomplishments have been the result of careful long-range planning and the successful accomplishment of these plans. Failures, of which there have been many, have been due to lack of careful planning or failure to carry out plans which had been carefully made.

No one of us would even guess what will happen during the next sixty years to our Society, the heating and air-conditioning industry, our nation, or the world, but we can and must plan two, five, ten, and even twenty years ahead if we are to show continued growth and progress.

The sudden growth of the heating and air-conditioning industry and the corresponding growth of the Society's membership during the past few years have made long-range planning mandatory if we are to meet the demands of the industry and the general public.

Accomplishment of long-range plans invariably involves both major and minor changes. Examples of major changes during the past few years include the establishment of the Research Laboratory in Cleveland in 1944 and complete overhauling of the Charter and By-Laws in 1950 involving a number of improvements in Society policy.

The Long-Range Planning Committee was established by the Council in 1953 to examine all phases of the Society's activities and to recommend whatever changes would be required in the future to meet the aims of the Society and to ensure the continued growth and progress of the Society.

Since its formation, this Committee with the assistance of other committees, individuals, and consultants has had an opportunity to make very exhaustive investigations into some of the activities of the Society, and following long discussions has made several recommendations to the Council.

You, as members, have already been asked to vote on some of the changes resulting from these committee recommendations, and there will be more in the future. The Long-Range Planning Committee or its equivalent and long-range planning must go on indefinitely if we are to continue as the realistic leader of the industry.

The long-range studies have been subdivided into these classifications: Technical Services, Publications and Meetings, Administration, Membership, Chapters, Finance and Public Relations.

So far, particular attention has been given to research, publications, headquarters location and personnel, membership grades, chapters, student branches, regional organization, additional sources of income, research fund raising, and public relations.

We may not be able to guess what will happen during the next 60 years, but students of economy almost unanimously predict a gradual improvement in our economy during the next few years and a faster improvement in the nineteen-sixties. They also agree that the heating and air-conditioning industry will continue to be one of our fastest growing industries in the years to come.

We must meet this challenge and continue to help the industry grow through careful and continuous long-range planning.

We have just finished the largest and finest Meeting and Exposition ever held by the Society. We have also just completed one of the most active and successful years in the history of the Society, and we all owe our immediate past president, Nat Hunter, a vote of gratitude for his tireless efforts in furthering the progress of the Society.

As we enter another year with an increase in membership and number of chapters we face an even greater responsibility to advance the arts and sciences of heating, ventilating, cooling, and air conditioning, and the allied arts and sciences, for the benefit of the general public.

J. E. Haines
President

American Society of Heating and Air-Conditioning Engineers

Solar Radiation During Cloudless Days[†]

By J. L. Threlkeld[*] and R. C. Jordan[**], Minneapolis, Minn.

This paper is the result of research sponsored by the American Society of Heating and Air-Conditioning Engineers, Inc. in cooperation with the Department of Mechanical Engineering of the University of Minnesota.

The world's present energy requirements for food, power and heat approximate 60 billion Btu per day; solar radiation intercepted by the earth each day equals about 5600 million million Btu. It is this vast differential which, in view of the rapidly dwindling fossil fuel deposits of the earth, is accelerating exploitation of solar energy. Of the sun's rays reaching the earth's outer atmosphere, only 16 percent reaches the land areas of the world, but the one percent intercepted by the continental United States is equivalent to about 800 tons of coal per acre per year.

Although utilization of solar energy poses many technical problems, the stakes are large. Currently, about 40 percent of all energy consumed in the United States is involved in space heating. Since space heating is accomplished at comparatively low energy levels, the technical problems are not as great as in other areas. However, space heating includes only a fraction of the potential uses to which solar energy may be placed eventually. Some, as with the potential use of solar energy for space heating, involve replacement of fuels by solar energy. In this category are also included the generation of electricity by thermopiles consisting of thermocouples with high thermoelectric effect and the generation of electricity by photogalvanic effects, or by so-called *solar batteries* such as the one under development by Bell Telephone Laboratories which utilizes a silicon *p-n* junction, similar to a junction transistor. Upon the absorption of light on the *battery* surfaces a potential is developed between the ends of the crystals through the liberation and migration of free-to-move negative and positive electric charges.

SUMMARY — This paper presents the results of research on the incidence of solar and sky radiation during cloudless days on horizontal, south-facing vertical and south-facing tilted surfaces. Calculated curves based upon an assumed standard summer atmosphere and an assumed standard winter atmosphere are presented. Comparisons of the calculated curves with recorded clear day radiation measurements are made for Lincoln, Neb.; Madison, Wis.; Columbia, Mo.; Rapid City, S. D.; Nashville, Tenn.; and Blue Hill, Mass.

There are many potential additional uses, however, which may, upon development, extend our standard of living through new energy applications. For example, in order to reduce agricultural wastes, the final drying of such crops as corn and hay is, in some instances, now being accomplished artificially through oil-fired drying systems. Since the intermittency of solar energy is here no disadvantage, it is quite possible that solar drying systems could extend this practice at a marked reduction in processing cost. Another potential application is the drying of peat for fuel. Dried peat is used as a power fuel in Russia, Germany, Ireland and, to a lesser extent, in Denmark, Sweden and Finland. In this country it is not yet economically competitive with other fuels, but the fact remains that about 14 billion tons of peat are potentially available. If this can be dried economically, our fossil fuel reserves will be extended appreciably. A third example of the possible extension of living standards concerns the current pilot plant attempts to culture the single celled alga, chlorella, by circulation in a closed nutrient solution periodically exposed to full sunlight. Since algae are capable of absorbing intense light during brief periods and later utilizing this energy in photosynthesis, this may develop more efficient sources of protein than any of our current farming methods. Potentially, chlorella culture can provide a protein yield per acre 200 times greater than soybeans.

In the adaptation of solar energy to the solution of engineering problems, three factors are involved: (1) determination of the availability and reliability of the energy supply, (2) determination of the energy requirements of the problem to be solved and (3) development of efficient collection or conversion equipment.

Currently, one of the most important problems involves an evaluation of the energy source, and this paper provides an extension of the present knowledge. Engineering applications will require information as to the incidence of solar radiation outside the atmosphere, at various depths of the atmosphere, at the earth's surface during cloudless days, and at the earth's surface during all days. Test results reported by Maria Telkes and Eleanor Raymond[1] on the solar house at Dover, Mass. show that almost 94 percent of the energy collected in the month of February 1949 occurred during 15 days of above average incident radiation. Thus, it is possible that the extent and reliability of cloudless day radiation may prove to be of major importance in the design of equipment for solar energy collection and conversion. This paper provides an engineering estimate of the incidence of solar radiation at the earth's surface during cloudless days.

[†] This paper is the result of researches sponsored by the American Society of Heating and Air-Conditioning Engineers, Inc., the Minnesota Institute of Research and the Graduate School of the University of Minnesota, conducted through the Department of Mechanical Engineering of the University of Minnesota.

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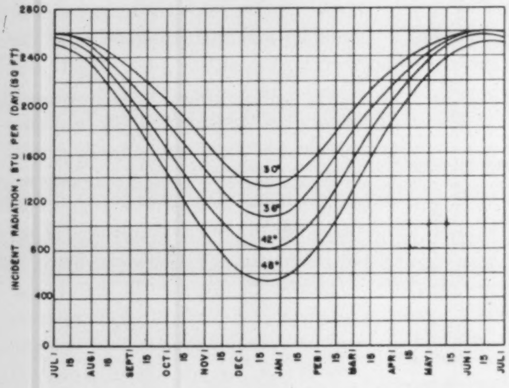

Fig. 1—Daily total solar and sky radiation incident upon a horizontal surface during cloudless days at various north latitudes

Methods of Calculation

This section discusses methods of calculating solar and sky radiation during cloudless days at the latitudes and for the conditions applicable to the United States.

Direct Solar Radiation Perpendicular to Sun's Rays: In a very important paper, Parry Moon[2] has presented a method of calculating the direct solar irradiation of a surface normal to the sun's rays during cloudless days for any elevation and for varying amounts of water vapor and dust in the atmosphere. Moon has calculated spectral irradiation curves for assumed atmospheric conditions of sea level, 20 mm of precipitable water, 300 dust particles per cc, and 2.8 mm of ozone. The ASHAE has taken these data as a standard for clear atmospheres and typical summer conditions and has correlated them in THE GUIDE[3] showing direct solar radiation at normal incidence as a function of the solar altitude angle.

F. W. Hutchinson and W. P. Chapman[4] have applied Parry Moon's calculation method to an assumed standard winter atmosphere at sea level, 33 F dew-point temperature, 300 dust particles per cc and 2.8 mm of ozone. Their results are correlated by a curve showing direct solar radiation at normal incidence as a function of the solar altitude angle.

Sky Radiation: Parmelee[5] has contributed important information on the irradiation of horizontal and vertical surfaces by diffuse or sky radiation. However, many of the calculations for this paper were made prior to publication of Parmelee's paper and sky radiation values were taken from curves presented in a previous publication[6] by the authors. Since during cloudless days the magnitude of diffuse radiation is generally small compared to the direct solar component, this circumstance has little effect on the results presented in this paper.

Solar and Sky Radiation — Horizontal Surfaces: The intensity of direct radiation incident upon a horizontal surface is given by the relation

$$I_H = I_N \sin \beta \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where

I_H = direct solar radiation incident upon horizontal surface, Btu per (hour) (square foot).

I_N = direct solar radiation incident upon a surface normal to sun's rays, Btu per (hour) (square foot).

β = solar altitude angle.

The total hourly rate of radiation is found by adding the diffuse radiation to that calculated by Equation 1. The total radiation incident upon the surface during the day is found by summing up the hourly rates using Simpson's rule.

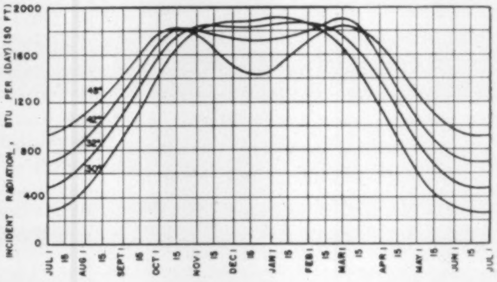

Fig. 2—Daily total solar and sky radiation incident upon a south-facing vertical surface during cloudless days at various north latitudes

Fig. 1 shows daily total solar and sky radiation incident upon a horizontal surface during cloudless days for north latitudes of 30, 36, 42, and 48 deg. In calculating the curves of Fig. 1, computations for May through September were made using Moon's values[3] for I_N in Equation 1 and Parmelee's values[5] for diffuse radiation, while for October through April Hutchinson's and Chapman's values[4] were used for I_N and the authors' values were used for diffuse radiation. The two sets of daily totals were plotted with the spring and autumn values of each set adjusted to give the smooth curves of Fig. 1.

Fig. 1 shows that maximum energy incidence on a horizontal surface occurs at 30 deg north latitude with a yearly peak of about 2600 Btu per (day) (sq ft) during the June and

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[1] Exponent numerals refer to References.

July period. There is relatively little difference in radiation incidence during the summer months between the several latitudes. Thus, the irradiation of a horizontal surface during cloudless days is fairly uniform in the United States except in mountainous locations and in industrial regions where the atmosphere is heavily polluted with dust. Because of much smaller solar altitude angles in winter, energy incidence is much lower in winter months with a minimum of about 550 Btu per (day) (sq ft) occurring in December at 48 deg north latitude.

Solar and Sky Radiation — South-facing Vertical Surfaces: The intensity of direct radiation incident upon a south-facing vertical surface is given by the relation

$$I_{SV} = I_N \cos \beta \cos \alpha \text{ ....} (2)$$

where

I_{SV} = direct solar radiation incident upon south-facing vertical surface, Btu per (hour) (square foot).
I_N = direct solar radiation incident upon a surface normal to sun's rays, Btu per (hour) (square foot).
β = solar altitude angle.
α = wall solar azimuth angle.

The total hourly rate of radiation is found by adding the diffuse radiation to the direct component calculated by Equation 2 with daily totals of incidence found by summing up the hourly rates using Simpson's rule.

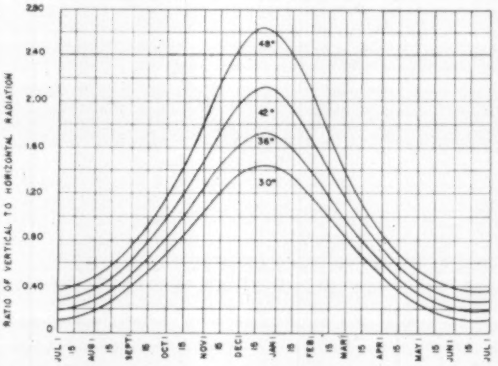


Fig. 3—Ratio of daily total solar and sky radiation incident upon a south-facing vertical surface to that incident upon a horizontal surface during cloudless days at various north latitudes

Fig. 2 shows daily total solar and sky radiation incident upon a south-facing vertical surface during cloudless days for north latitudes of 30, 36, 42 and 48 deg. The same sources of information for normal incidence radiation and diffuse radiation were used in calculating Fig. 2 as for Fig. 1. Fig. 2 shows that maximum winter incidence and minimum summer incidence upon a south-facing vertical surface occurs at 30 deg north latitude. A peak of about 1900 Btu per (day) (sq ft) occurs on about January 1 at 30 deg while peaks of about 1800 Btu per (day) (sq ft) occur on October 15 and March 1 at 48 deg north latitude. Incidence during the winter months is fairly uniform except at 48 deg latitude where a minimum occurs on December 22.

Fig. 3 shows the ratio of south-facing vertical to horizontal radiation during cloudless days and was calculated from the data for Figs. 1 and 2. Fig. 3 illustrates the superiority of the south-facing surface for winter collection of sunshine, especially at the more northerly latitudes.

Solar and Sky Radiation — South-facing Tilted Surfaces: If a south-facing surface is tilted from the vertical position by an angle ϕ, the intensity of direct solar radiation incident upon this surface is given by the relation

$$I_{ST} = I_N (\sin \beta \sin \phi + \cos \beta \cos \alpha \cos \phi) \text{ ....} (3)$$

where

I_{ST} = direct solar radiation incident upon south-facing tilted surface, Btu per (hour) (square foot).
I_N = direct solar radiation incident upon a surface normal to sun's rays, Btu per (hour) (square foot).
β = solar altitude angle.
α = wall solar azimuth angle.
ϕ = angle of tilt from vertical position.

Combining Equations 1, 2 and 3 gives

$$I_{ST} = I_H \sin \phi + I_{SV} \cos \phi \text{ ......} (4)$$

An optimum tilt angle may be found by differentiating Equations 3 or 4 with respect to ϕ, and equating to zero, considering I_N, β and α as constants. The result is

$$\tan \phi = \tan \beta / \cos \alpha = I_H / I_{SV} \text{ ..} (5)$$

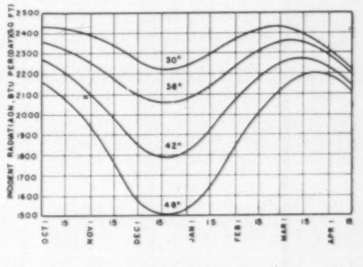


Fig. 4—Daily total solar and sky radiation incident upon a south-facing surface tilted from the horizontal at an angle equal to the latitude plus 21 deg during cloudless days at various north latitudes

Since β and α are variables, the optimum tilt angle also varies. In systems utilizing solar energy for space heating, practical considerations dictate a fixed position for the collector. Thus, an optimum tilt must be determined over a period of time rather than for a particular instant. Since the December-February period is critical for a solar heating system, the method was adopted to assume the tilted surface perpendicular to the sun's rays at 12:00 noon on January 15. This requires that the tilt angle ϕ be equal to the solar altitude angle for this time. The tilt angles thus determined are shown in Table 1. It is observed that in every case the tilt angle from the horizontal position is closely equal to the latitude plus 21 deg.

Table 1—Tilt Angles Required to Make a South-facing Surface Normal to Sun's Rays at Noon on January 15

North Latitude	Tilt Angle from Vertical		Tilt Angle from Horizontal	
Deg	Deg	Min	Deg	Min
30	38	51	51	9
36	32	49	57	11
42	26	49	63	11
48	20	49	69	11

Fig. 4 shows daily total solar and sky radiation incident upon a south-facing surface tilted by the angles shown in Table 1 for the winter period October 1 to April 15. In the construction of Fig. 4, hourly rates of direct solar radiation were calculated by Equation 4. Since there is no information on diffuse radiation incident upon tilted surfaces, this component was estimated by the linear relation

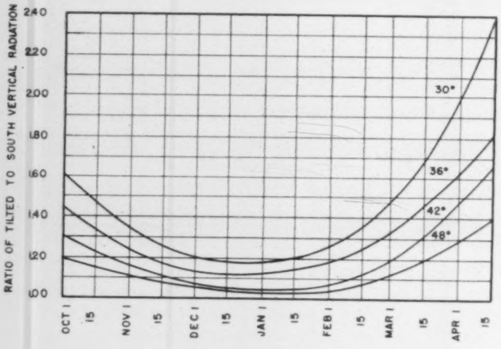


Fig. 5—Ratio of daily total solar and sky radiation incident upon a south-facing surface tilted from the horizontal at an angle equal to the latitude plus 21 deg to that incident upon a south-facing vertical surface during cloudless days at various north latitudes

$$I_{ST,d} = I_{SV,d} + (I_{H,d} - I_{SV,d}) \phi/90 \quad \text{.................(6)}$$

where

$I_{ST,d}$ = diffuse radiation incident upon tilted surface, Btu per (hour) (square foot).

$I_{SV,d}$ = diffuse radiation incident upon south-facing vertical surface, Btu per (hour) (square foot).

$I_{H,d}$ = diffuse radiation incident upon horizontal surface, Btu per (hour) (square foot).

ϕ = tilt angle from vertical position, degrees.

The total hourly rates found by adding Equations 4 and 6 were summed by Simpson's rule to give daily totals.

Fig. 4 shows that the incidence of radiation upon a south-facing surface tilted from the horizontal by an angle equal to the latitude plus 21 deg is a maximum in the southern part of the United States with the effect of latitude being most significant in the month of December.

Fig. 5 shows the ratio of south-facing tilted to south-facing vertical radiation during cloudless days for the October 1 to April 15 period and was calculated from the data for Figs. 2 and 4. Fig. 5 shows that the advantage of tilting is most pronounced in the more southerly latitudes where an increase of about 20 percent occurs during the December-January period at 30 deg north latitude. Fig. 5 also shows that in the more northerly latitudes during the December-January period very little increase of incident radiation results from tilting the south-facing surface.

Comparison of Calculated and Recorded Radiation During Clear Days

The calculated results previously presented are for an assumed standard atmosphere at sea level. The dust content of 300 particles per cc is representative of a reasonably clean atmosphere. As a check on the calculations, comparisons were made with recorded radiation published by the U. S. Weather Bureau for Lincoln, Neb.; Madison, Wis.; Columbia, Mo.; Rapid City, S. D.; Nashville, Tenn.; and Blue Hill, Mass. The plotted points shown in Figs. 6-12 are daily totals of recorded radiation for days with 0-2 cloudiness and 95-100 percent sunshine.

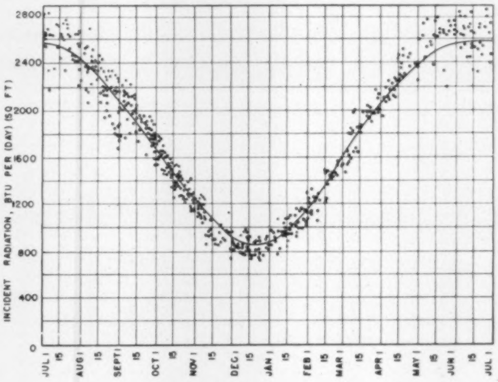


Fig. 6—Comparison of calculated and recorded solar and sky radiation incident upon a horizontal surface during clear days at Lincoln, Neb.

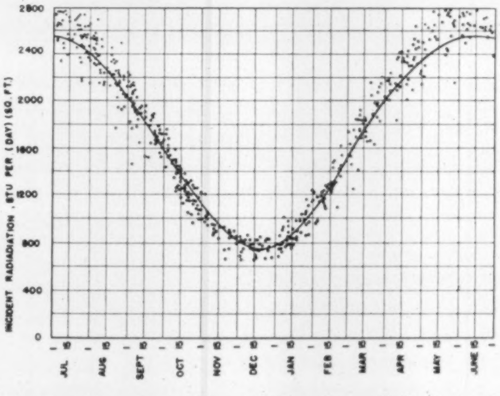


Fig. 7—Comparison of calculated and recorded solar and sky radiation incident upon a horizontal surface during clear days at Madison, Wis.

Fig. 6 shows a comparison of the curve of calculated solar and sky radiation incident upon a horizontal surface for the latitude of Lincoln, Neb. (40 deg, 49 min) with plotted points of clear day radiation as recorded on a horizontal surface at Lincoln for the 10-year period 1944-1953. It is evident that the assumed standard atmosphere calculation gives a very good average correlation.

Fig. 7 shows a similar comparison of calculated and recorded radiation incident upon a horizontal surface for Madison, Wis., latitude 43 deg, 8 min, for the 10-year period 1944-1953. It is seen that the calculated curve gives a good average correlation except in the May-August period when it is about 5 percent too low.

Fig. 8 shows a comparison of calculated and recorded radiation incident upon a horizontal surface for Columbia, Mo., latitude 38 deg, 57 min, for the 10-year period 1944-1953. The calculated curve results in a reasonably good correlation for the winter months but is consistently low by 5 to 10 percent during the April-September period.

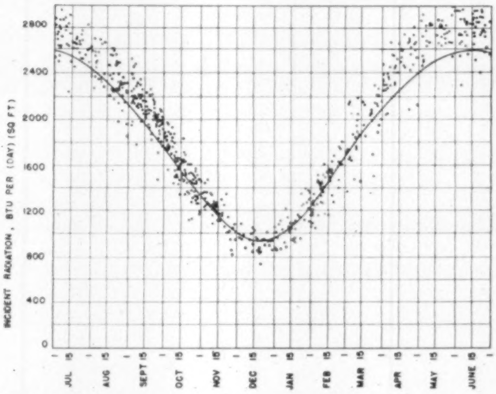


Fig. 8—Comparison of calculated and recorded solar and sky radiation incident upon a horizontal surface during clear days at Columbia, Mo.

Fig. 9 shows a comparison of calculated and recorded radiation incident upon a horizontal surface for Rapid City, S. D., latitude 44 deg, 9 min, for the five-year period 1949-1953. Although there are insufficient points for a representative comparison, it appears that the calculated curve is consistently low by about 5 to 10 percent.

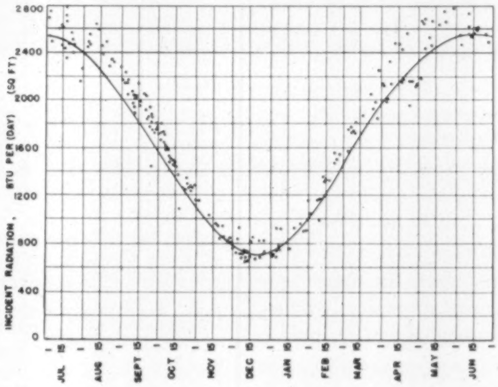


Fig. 9—Comparison of calculated and recorded solar and sky radiation incident upon a horizontal surface during clear days at Rapid City, S. D.

Fig. 10 shows a comparison of calculated and recorded radiation incident upon a horizontal surface for Nashville, Tenn., latitude 36 deg, 9 min, for the eight-year period 1944-1948, and 1951-1953. It is seen that the calculated curve gives a good average correlation for the April-September period but is high by some 15 to 20 percent during the winter months. According to Hand[7], considerable smoke contamination in winter months occurs at Nashville and this may account for the higher radiation as indicated by the calculated curve.

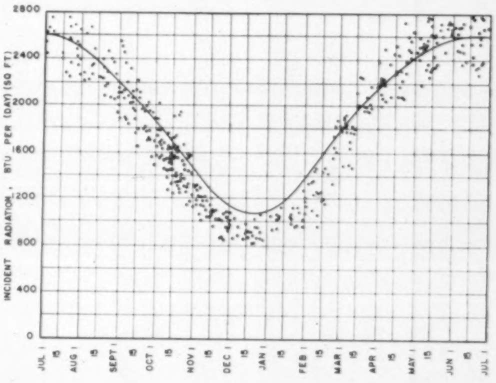


Fig. 10—Comparison of calculated and recorded solar and sky radiation incident upon a horizontal surface during clear days at Nashville, Tenn.

Fig. 11 shows a comparison of calculated and recorded radiation incident upon a horizontal surface during clear days for Blue Hill, Mass. The latitude of Blue Hill is 42 deg, 13 min. The plotted points represent but five years of data (1949-1953) which are inadequate for a representative comparison. The calculated curve compares favorably with the recorded data during winter months but is consistently low during the March-September period by some 5-10 percent.

Fig. 12 shows a comparison of calculated and recorded radiation incident upon a south-facing vertical surface during clear days for Blue Hill, Mass. The plotted points are for the same years of data as Fig. 11 and thus are not sufficient for an average comparison. During the April-October period the calculated curve is low by some 5 to 10 percent or by a similar deficiency to the calculated curve of Fig. 11 for a horizontal surface. However, in the December-February period the calculated curve is much too low, indicating on some days a considerable increase by reflection from the ground.

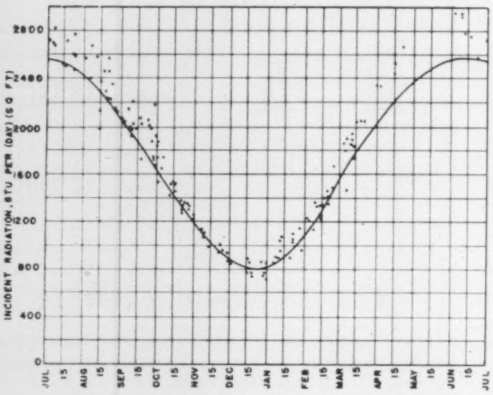


Fig. 11—Comparison of calculated and recorded solar and sky radiation incident upon a horizontal surface during clear days at Blue Hill, Mass.

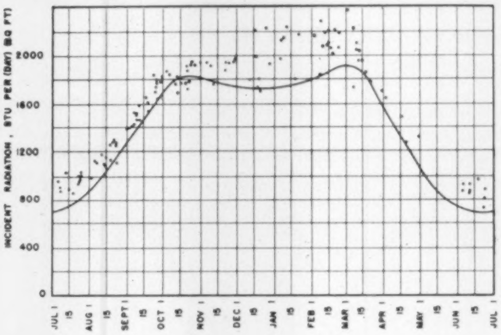


Fig. 12—Comparison of calculated and recorded solar and sky radiation incident upon a south-facing vertical surface during clear days at Blue Hill, Mass.

Conclusions

The authors believe that the calculated curves on cloudless day radiation shown in Figs. 1 through 5 are sufficiently accurate for engineering purposes for all localities in the United States except mountainous locations and highly industrialized regions. Comparison of calculated and recorded radiation incident upon a horizontal surface for six localities indicate average correlation by the calculation method within about 5 to 10 percent except at Nashville, Tenn. The calculated curves presented in this paper are based upon the basic equations developed by Parry Moon[2] and these equations may be applied to any type of atmosphere including mountainous and industrial regions.

Maximum incidence of solar and sky radiation on a horizontal surface during cloudless days occurs in the southern part of the United States, although in summer months the radiation is fairly uniform throughout the country. In winter months a significantly greater incidence occurs in the more southerly latitudes.

Maximum incidence of solar and sky radiation on a south-facing vertical surface during cloudless days occurs in the southern part of the United States in winter and in the northern part of the country in summer. The ratio of south-facing vertical to horizontal surface radiation incidence is larger throughout the year at the more northerly latitudes, reaching a maximum in December.

The tilting of a south-facing surface in winter months may increase the incidence of radiation during cloudless days by 20 percent or more over that of a south-facing vertical surface in the more southerly latitudes. In the northerly latitudes, the increase is much smaller, being less than 5 percent for December and January at 48 deg north latitude.

Further pyrheliometric studies are necessary to establish the effect of ground reflection of radiation on vertically-placed and tilted surfaces. In winter months a considerable increase of incident radiation beyond the calculated amount may occur by reflection from a snow-covered ground surface. The advantages of tilting a south-facing surface are dependent also upon ground reflection, since a tilted surface receives less reflected radiation than a vertically-placed surface.

References

1. Storing Solar Heat in Chemicals — A Report of the Dover House, by Maria Telkes and Eleanor Raymond (*Heating and Ventilating*, Vol. 46, November 1949, p. 85).

2. Proposed Standard Radiation Curves for Engineering Use, by Parry Moon (*Journal of the Franklin Institute*, Vol. 240, November 1940, pp. 583-617).

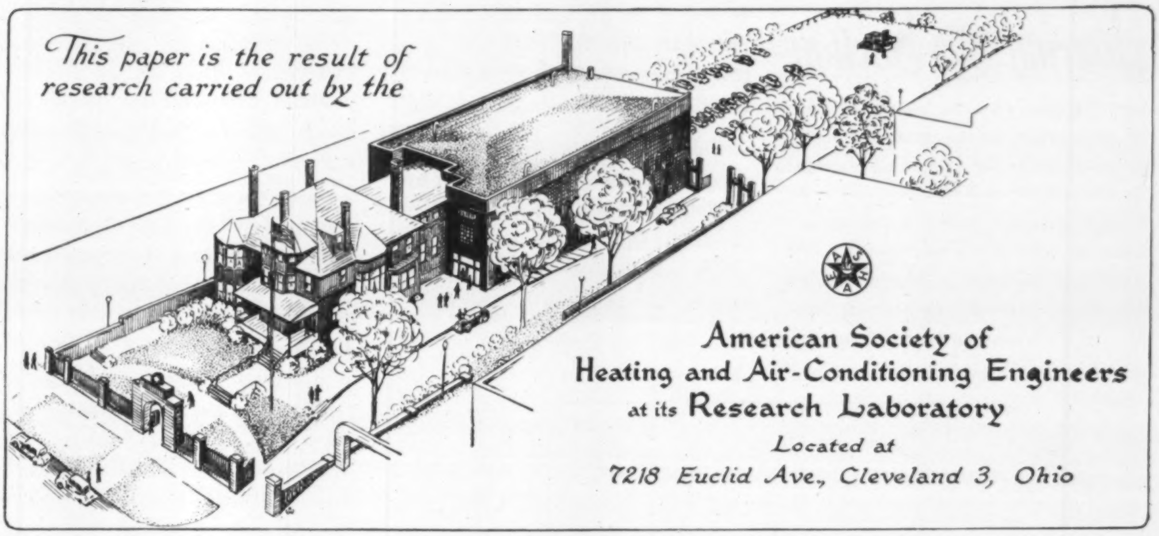
3. HEATING, VENTILATING, AIR CONDITIONING GUIDE 1954, 32nd Edition (published by THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, New York, N.Y., p. 275).

4. A Rational Basis for Solar Heating Analysis, by F. W. Hutchinson and W. P. Chapman (ASHVE TRANSACTIONS, Vol. 52, 1946, p. 305).

5. Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies, by G. V. Parmelee (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, August 1954, pp. 129-137).

6. Solar Energy Availability for Heating in the United States, by R. C. Jordan and J. L. Threlkeld (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, December 1953, p. 116).

7. Pyrheliometers and Pyrheliometric Measurements, by I. F. Hand (U. S. Weather Bureau, Washington, D.C., 1946).


This paper is the result of
research carried out by the
American Society of
Heating and Air-Conditioning Engineers
at its Research Laboratory
Located at
7218 Euclid Ave., Cleveland 3, Ohio

Circuit Analysis Applied to Load Estimating

Part II — Influence of Transmitted Solar Radiation

By H. B. Nottage*, Santa Monica, Calif., and G. V. Parmelee**, Cleveland, Ohio

SUMMARY—In this continuation of a previous paper, solar radiation directly transmitted through the glass portion of a north-exposed wall has been included to complete the prediction of instantaneous room cooling load throughout a 24-hr cycle. The practice of taking instantaneous rate of heat gain as cooling load is shown to overestimate the instantaneous load, because it does not consider the interaction between the internal walls, floor and ceiling of the room with those sections of the room that are exposed to the weather. This interaction causes cyclic variations in the surface temperatures of the inner sections with consequent cycles of heat storage and withdrawal from these sections of part of the energy which enters the room.

This paper further demonstrates the value of analyzing thermal systems by circuit principles and recommends continued application of these principles in load estimating and in studying the behavior of thermal systems and their components.

AIR-CONDITIONING engineers have been faced for many years with the problem of making suitable allowances in load estimates for the thermal capacity of the interior sections of buildings. Under conditions of periodic variations in solar intensity, outdoor temperature, and the outputs of various internal energy sources, these sections store and release in a cyclic manner part of the heat which enters an air-conditioned space. As a result, there can be a considerable difference between the instantaneous load on a cooling system and the calculated instantaneous rate of heat flow into the space. This has been demonstrated and pointed out in many papers.

Although practical means of calculating instantaneous rates of heat flow through weather-exposed building sections are in common use and take heat storage into account, means of adequately treating the heat-capacity effects of entire structures on cooling (or heating) system loads are still in the development stage. In the first ASHAE paper[1] on circuit analysis, the fundamental concept of representing thermal systems by thermal-circuit diagrams and a method of analyzing such circuits were developed. This concept recognizes that the thermal system of structure, equipment, furnishings, and outdoor environment constitutes a system of thermal capacitances, energy sources and energy receivers interconnected by thermal resistances. The thermal-circuit diagram shows these interconnections and thereby facilitates analysis. Moreover, the circuit diagram visually emphasizes the basic point that what-

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[1] Exponent numerals refer to References.

Journal Section

ever happens at some instant of time at one point in the system or circuit influences the rest of the system.

This paper, and the first, are concerned mainly with developing principles of circuit diagramming and analysis. However, to sharpen reader familiarity with the subject an illustrative problem has been set up and solved. For convenience, solution of the problem has been divided into:

Phase A—Analysis of cooling load due to the outdoor environment but *excluding* the effects of solar radiation transmitted directly through glass, and

Phase B—Analysis of cooling load due *only* to solar radiation transmitted through glass.

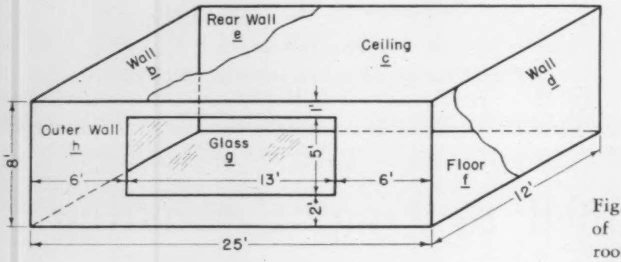


Fig. 1—Sketch of north-exposure room for illustrative problem

Results for Phase A only were given in the initial paper. The present paper gives the results for Phase B as (1), the load due only to transmitted-solar radiation and (2), this load plus the Phase A results.

Advisory guidance has been given by the Technical Advisory Committees on Cooling Load[†] and Heat Flow Through Glass[‡].

Illustrative Example

The thermal system established in the first paper and for this paper is the *north-exposure* room sketched in Fig. 1. The instantaneous load is to be found for an air-cooling system that maintains the room air at a temperature of 75 F throughout a 24-hr cycle.

Only loads arising from the influence of the outdoor environment are considered. Three energy sources are involved. One is the time-variable sol-air temperature for the weather side of the outer wall *h*. A second is the time-variable temperature of the window, which is warmed by the outdoor air and by absorption of part of the incident solar radiation. The load resulting from these two sources was given in the first paper[1] as Phase A results. The third load-producing source is the time-variable quantity of solar radiation which enters the room by direct transmission through the glass. In thermal-circuit terminology, the first two sources are described as *thermal-potential* (*temperature*) *generating* energy sources. The third is called a *thermal-current-generating* source.

As in Phase A, two cases are analyzed as follows: Case I — Single-glass window; Case II — Glass-block window. The glass block is that described in Chapter 13 of The Guide 1954 as Type I.

Structural details are the same as for Phase A, but are repeated in this paper for convenience in Table 1. The postulated conditions which further define the problem include the condition of no heat flow across the mid-planes of the ceiling, the floor and the interior walls. In effect, then, the adjoining spaces are at the same temperature as the room chosen for analysis.

Table 1—Assumed Structural Details and Thermal Properties for the Illustrative Example

Room Component	Symbol, Fig. 1	Material	Total Thick., in.	Surface Area sq ft	k Btu/(hr)(sq ft)(F deg/ft)	ρ lb/cu ft	c_p Btu/lb F deg	α sq ft/hr
Floor	*f*	Concrete, no covering	4	300	0.41	97	0.21	0.020
Ceiling	*c*	Same as floor						
Interior Partitions	*e*	Gypsum lath & plaster	7/8	200	0.275	70	0.23	0.017
		Wood studs, 1¾ x 3¾ in. spaced 16-in centers	—	—	0.085	30	0.40	0.007
	b, d	Same		96				
Exterior Wall	*h*	Brick	4	135	0.51[a]	112[a]	0.20	0.023
		Mortar	½	135	1.0	115	0.22	0.039
		Cinder-concrete blocks	8	135	0.40[a]	57[a]	0.21	0.033
		Furring space, lath & plaster, taken to be same as for interior partitions.						
Glass	*g*	Case I — Single common window glass — 65 sq ft Case II — Type I 8-in. glass blocks Smooth exterior faces, wide ribs or flutes on interior faces — 65 sq ft						

[a] For solid substance with no core holes, having the same net weight and overall thermal resistance as the actual structural units. Symbols: k = thermal conductivity; ρ = density; c_p = unit heat capacity at constant pressure; α = thermal diffusivity.

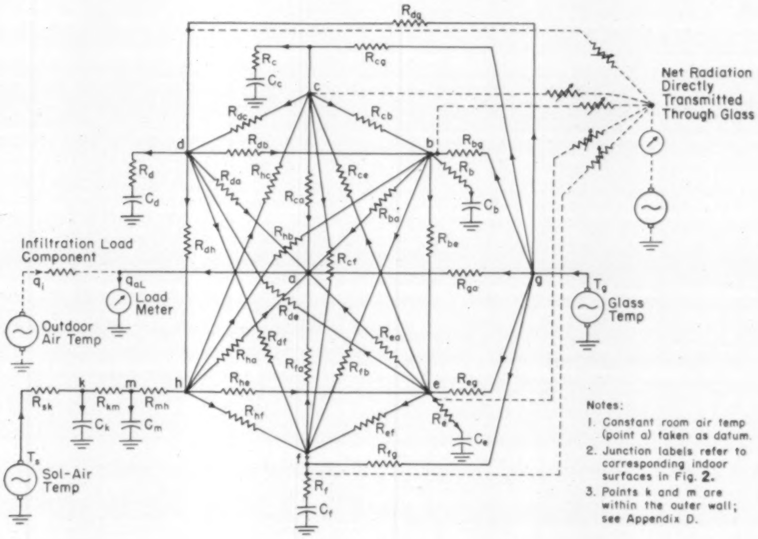
In order to approach a practical situation, the weather conditions chosen for this *north-exposure* room are those for a clear atmosphere on an August 1 design day at 40 deg North latitude. The diurnal cycle of dry-bulb temperature is that given in Table 8 of Chapter 13 of The Guide 1954 and has a maximum of 95 F at 3:00 p.m. suntime and a minimum of 74 F at 5:00 a.m. The solar data used in the problem are discussed later.

[†] Personnel: C. O. Mackey, Chairman; R. C. Jordan, Vice Chairman; K. O. Alexander, John Everetts, Jr., H. T. Gilkey, R. H. Heilman, H. W. Heisterkamp, A. J. Hess, A. T. Jorn, C. F. Kayan, J. N. Livermore, P. E. McNall, Jr., I. A. Naman, H. B. Nottage, C. P. Roberts, J. P. Stewart, H. B. Vincent, T. N. Willcox, W. E. Zieber.

[‡] Personnel: R. A. Miller, Chairman; N. B. Hutcheon, Vice Chairman; W. J. Arner, F. L. Bishop, E. W. Conover, D. D'Eustachio, W. B. Ewing, J. E. Frazier, J. S. Herbert, R. W. McKinley, E. C. Miles, H. B. Vincent, C. J. Youngblood, Jr.

Circuit Diagram

The thermal circuit which represents this room under the imposed conditions is Fig. 2. The lettered junction points correspond to the lettered room surfaces of Fig. 1. The constant room-air temperature is junction point *a* in the center of the diagram. The dashed branches of the circuit connect the directly transmitted solar radiation, which enters the room through the glass, with the various room surfaces. Thermal-capacitance elements are designated as C_k, C_m, C_f, etc. and thermal-resistance elements as R_{mh}, R_{ha}, R_{hf}, etc. The thermal capacitance of the outer wall is the sum of the first two designated capacitances. The third equals half of the thermal capacitance of the floor (the other half would appear in the circuit for the adjoining room). The three designated resistances are respectively: part of the thermal resistance of the outer wall *h;* the convection resistance between *h* and the room air *a;* and the *radiation resistance* between wall surface *h* and floor surface *f*. Evaluations of these circuit quantities were described in appendixes to the first paper. The values are summarized in Appendix A of this paper□.



Notes:

1. Constant room air temp (point a) taken as datum.
2. Junction labels refer to corresponding indoor surfaces in Fig. **2.**
3. Points k and m are within the outer wall; see Appendix D.

Fig. 2—Thermal circuit to be solved

Circuit Principles

At this point, a brief explanation of circuit principles may encourage the reader to look upon the circuit diagram as a vivid *picture* of a typical *thermal system.* The circuit should *not* be regarded as an electrical circuit although electrical symbols were borrowed to represent thermal elements and although analogous electrical circuits are a useful means of solving thermal problems.

The basis for drawing and solving thermal circuits is the *principle of the thermal-current or heat balance.* Consider point *f* on the floor surface. A solar-radiation thermal current comes through the window and strikes the floor where it is absorbed. In the exchange of low-temperature radiation between *f* and the other room surfaces, thermal currents flow between these surfaces and *f* through radiation resistances, such as R_{hf}, connecting these surfaces with *f*. At the same time a convective thermal current flows from *f* to room air *a* (this is a cooling load current) through resistance R_{fa}. Also a conductive thermal current flows from *f* through resistance R_f into capacitance C_f, which stores this energy. At any instant of time, the algebraic sum of these thermal currents must equal zero in accord with the law of the conservation of energy.

Solving circuit problems consists simply in expressing the thermal-current balances for each junction point in mathematical equations and solving them simultaneously for the unknown circuit-junction temperatures. Thermal currents can then be computed. Alternately, some sort of physical analogue can be constructed and measurements made by instruments, a procedure similar to studying the performance of a full-scale thermal system. Further discussion will be confined to the mathematical method and other techniques developed in this and the previous paper. [1]

Superposition: In this paper, the thermal circuit is treated as a *linear* circuit; that is, one in which the thermal properties of the materials and the convection and radiation resistances are independent of temperature and rates of heat flow. Such a circuit permits direct *superposition* of the effects of all inputs treated separately and is the basis for analyzing the circuit in Phases A and B. For example, if, at some instant of time, the temperature of the floor surface *f* is found to be 1.5 deg above the constant room-air temperature of 75 F under the Phase A conditions only, and 1.2 deg above 75 F under the Phase B conditions only, the floor temperature for the combined conditions would be 75 F plus the sum of 1.5 and 1.2 or 77.7 F. Thermal currents are similarly added.

Though linearization of circuits is an idealization from the real system, a very important advantage is gained, namely, the ability to determine the separate contribution of each load-

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□Mimeographed copies of Appendixes A, B, C, and D of this paper may be obtained on written application to the ASHAE Research Laboratory, 7218 Euclid Ave., Cleveland 3, Ohio. They will be published with this paper in the TRANSACTIONS 1955.

producing element to the total system load. Furthermore, computation procedures (or analogue techniques) in circuit analysis are simplified.

In the Phase A calculations, the sol-air and glass inner-surface temperatures were established by calculations based upon the chosen solar-radiation values, air temperature and outdoor convection conductance. The junction-point temperatures and thermal currents resulting from only these two cyclic potentials were solved for in Phase A. The solar-radiation current generator was removed and the dotted branch connections were left open.

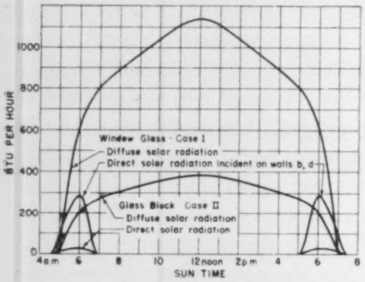
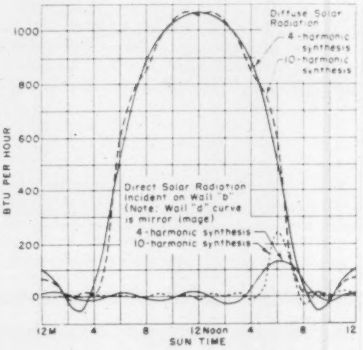


Fig. 3—Transmitted solar radiation thermal currents through window glass and glass block Type I for illustrative problem

In the Phase B problem, the circuit is solved under the condition that the transmitted-solar-radiation thermal-current source is connected via the dotted lines while the sol-air and glass-temperature generators are removed, leaving *g* and *s* connected to ground through the dotted jumpers shown in Fig. 2. This treatment is not essential to solving the circuit, but permits the solar-radiation load currents to be determined independently of the currents produced by other sources. This step is validated in Appendix B.

One more point with respect to circuit handling technique requires mention, namely, the matter of not connecting *g* to ground through an outdoor convection resistance. This is discussed in Appendix C.

Transmitted-Solar-Radiation Thermal Currents: The total transmitted-solar-radiation thermal current is the sum of a diffuse (or sky) component and a direct (or beamed) component. The thermal currents for this problem are shown in Fig. 3. With respect to the diffuse component, it was assumed that partial shading by the window opening was negligible. Hence hourly values of this component were multiplied by the window opening area of 65 sq ft. On the August 1 design day chosen for this problem, the direct component strikes a north-exposure wall or window only for a few hours early in the morning and again late in the afternoon. Moreover, the beam strikes the opening at such large incident angles that most of it is intercepted by the sides of the window opening in the thick wall. Therefore, hourly values of the direct component were multiplied by 65 sq ft times the fractional cross-section area of the beam which actually enters the room. These fractions are given in Table D-1 of Appendix D.



Hourly values of the diffuse and direct components which were used in computing the thermal currents of Fig. 3 were those used by the ASHAE Research Laboratory in preparing heat gain data tables for The Guide. The sums of these components now appear in Tables 13 and 20 of Chapter 13 of The Guide 1954 as instantaneous rates of heat gain due to transmitted direct and diffuse solar radiation by single common window glass and Type I glass block respectively. However, because the table values are rounded off to the nearest whole number, there are small differences between the table values times 65 sq ft and the curves of Fig. 3. For example, at noon the table value of 17 Btu per (hr) (sq ft) for north-exposed window glass on August 1 at 40 deg north latitude gives a total of 1105 Btu per hr whereas the diffuse component curve of Fig. 3 gives 1140, a value which also appears later on in the fourth column of Table 3. The result of partial shading of the direct beam is brought out in the following example: At 6:00 a.m. (and 6:00 p.m.) the table value of 26 Btu per (hr) (sq ft) given in The Guide gives a total of 1690 Btu per hr for window glass, whereas in this paper the sum of the direct and diffuse components is $(16.5 \times 0.268 + 9.5)$ 65 or 905 Btu per hr.

The distribution of the thermal currents among the room surfaces was determined as follows. With respect to the diffuse component it was assumed that the transmitted radiation emanated uniformly from the entire glass surface. The total, therefore, was divided among the various room surfaces in accordance with their shape factors with respect to the window. These fractions are given in Table D-1 of Appendix D and are the same for both Case I and Case II. This division is indicated by the dotted lines to the several junction points from the transmitted-radiation thermal-current source (Fig. 2). It was further assumed that the room surfaces completely absorbed the solar radiation incident upon them.

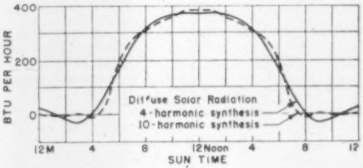


Fig. 4—Comparison between 4-harmonic and 10-harmonic syntheses of transmitted solar radiation thermal currents

(*a*) Case I — Window glass — (*left*)
(*b*) Case II — Glass block — (*above*)

A geometrical analysis of the direct beam shows that, of the beam *not* cut off by the window opening, only west wall *d* intercepts the beam in the morning and only east wall *b* in the afternoon. To avoid unnecessary complications in this illustrative problem, it was assumed that the plane of the glass coincides with the plane of the inner surface of wall *h*. Hence, the portion of the beam intercepted by the sides of the opening falls outside the room. It was assumed, therefore, that the energy in this part of the beam was dissipated to the outdoors. Note that the dotted connections to *b* and *d* carry diffuse radiation thermal currents and, at certain times, they carry these direct radiation currents as well.

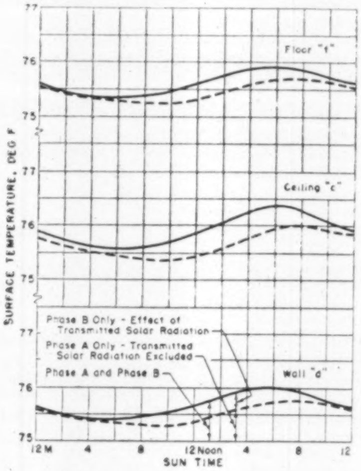


Fig. 5—Diurnal variations of temperatures of selected room surfaces as affected by conditions of Phases A and B compared with effect of conditions of Phase A only: Case I—Window Glass

A further assumption with respect to these two beams was that surfaces *b* and *d* maintain uniform temperatures at all times. Were this not done, the analysis would require each of these surfaces to be divided into a beam intercepting and a shadowed portion and the introduction of additional junction points in the circuit diagram. (This latter step might well be justified in some problems.)

In Case II, the transmitted direct-radiation currents are so small that they have been added directly to the load to obtain the total resultant loads. It should be emphasized that spatial distribution data on radiation from sources such as the sun and lighting fixtures are required in order to supply the proper current values to each room surface.

Fourier Series Expressions: The technique of circuit analysis used in this and the previous paper requires that periodic phenomena, such as sol-air temperatures and transmitted radiation currents, be expressed as Fourier series. Therefore, analyses of the curves of Fig. 3 were made through the first 10 harmonics. Table D-2 of Appendix D summarizes the harmonic coefficients. Figs. 4*a* and 4*b* give the four-harmonic and ten-harmonic syntheses. Comparison shows that the four-harmonic syntheses closely approximate the corresponding curves of Fig. 3 and therefore were used in the Phase B calculations. This point is discussed further at the end of the paper.

Circuit Equations and Their Solution: Circuit equations are written by making instantaneous thermal current balances on each junction point in Fig. 2. As previously noted the instantaneous algebraic sum of all the currents entering a junction point must be zero. In thermal circuits current flow in both resistance and capacitance branches must be considered. This is treated by the concepts of thermal admittance and thermal impedance, which were explained in the first paper[1]. Admittance and impedance are analogous to conductance and resistance respectively, so that

$$\text{Thermal Current} = \frac{\text{Thermal Potential Difference}}{\text{Thermal Impedance}} \qquad (1)$$

$$\text{Thermal Current} = \text{Thermal Admittance} \times \text{Thermal Potential Difference} \qquad (2)$$

where

Thermal Current = Btu per hour
Thermal Potential Difference = Fahrenheit degrees
Thermal Impedance = Fahrenheit degrees per (Btu) (hour)
Thermal Admittance = Btu per hour (Fahrenheit degree)

The various currents, then, are expressed in terms of junction potentials and branch admittances in accord with Equation 2, or as quantities, such as the solar radiation thermal currents, which are known from the conditions of the problem. The number of equations is equal to the number of unknown junction potentials. The techniques of writing equations and the use of *vector notation* have been explained in the previous paper.

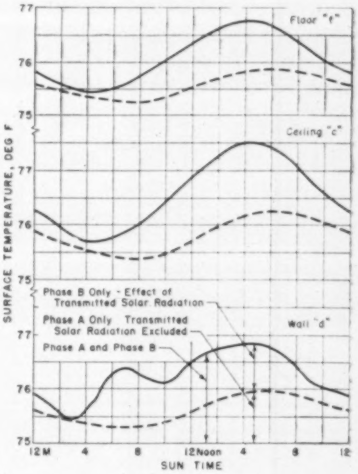


Fig. 6—Diurnal variations of temperatures of selected room surfaces as affected by conditions of **Phases A and B** compared with effect of conditions of **Phase A** only: Case II—Glass Block

Tables D-3 and D-4 of Appendix D give the equations to be solved. Solutions were obtained by means of a computing machine designed to solve simultaneous linear algebraic equations and are in the form of Fourier series coefficients for the junction-point potentials. These are listed in Table D-5.

Results and Discussion

Structural Temperature Cycles: Figs. 5 and 6 give the temperature cycles for the floor, ceiling, and end wall *d*, and show the influence of directly transmitted radiation by comparison of the Phase A and Phase B magnitudes. Curves for the other surfaces can be plotted from the data of Table D-5.

The bump in the curve for wall *d* in Case I is the result of direct or beamed radiation falling on this surface for about two hours early in the morning, in addition to the diffuse radiation, which increases slowly to a maximum at noon and then decreases. The differences between the pairs of curves represent the maximum attainable improvement by shading devices. It is worth noting that though the room-air temperature is held constant, the area-weighted average temperature of the room surfaces is somewhat higher. In Case I this temperature was a maximum of 2.8 deg above the room air temperature for Phases A and B combined. Note further that orientations other than the north used for this problem receive much more solar radiation.

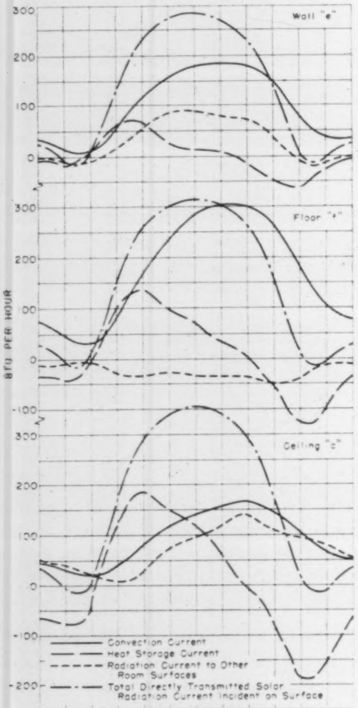


Fig. 7—Thermal currents for Case I — Window Glass — Phase B only

Structural Thermal-Current Cycles: Currents in the various circuit branches are computed as the vector products of the corresponding admittances and potential differences. Complete current cycles for the floor, ceiling, and wall *e* (opposite the glass) are given in Fig. 7 for Case I, single window glass, and in Fig. 8, Case II, glass block. Resultant currents are given in Fig. 9 and show the effect of thermal storage on load due to directly transmitted radiation. For Case I in Fig. 9 the solar radiation curve is the sum of the four-harmonic synthesized curve of transmitted diffuse solar radiation and the synthesized curves of transmitted direct radiation which falls on end walls *b* and *d*. These are shown separately in Fig. 4*a*. For Case II the curve is identical with the four-harmonic synthesized curve of Fig. 4*b*. The small direct-to-load radiation component of Case II is not included.

Table 2—Instantaneous System-Load Components by Circuit Analysis

Heat-Flow Rates—Btu per Hour

Sun Time	Case I—Window Glass			Case II—Glass Block			
	Phase A	Phase[a] B	Total	Phase A	Phase B		Total
					Diffuse	Direct[b]	
12 Mn	763	204	967	747	62		809
1 a.m.	673	173	846	667	52		719
2	596	126	722	576	33		609
3	515	87	602	506	25		531
4	427	84	511	460	29		489
5	382	145	527	410	44	14	468
6	361	205	566	460	69	28	557
7	347	398	745	421	103		524
8	398	500	898	353	140		493
9	513	575	1088	342	184		526
10	666	643	1309	388	224		612
11	883	713	1596	479	258		737
12 N	1101	783	1884	608	280		888
1 p.m.	1276	818	2094	751	296		1047
2	1406	824	2230	886	302		1188
3	1499	824	2323	985	306		1291
4	1539	823	2362	1079	301		1380
5	1540	806	2346	1174	279		1453
6	1501	757	2258	1280	244	28	1552
7	1348	657	2005	1256	199	14	1469
8	1264	500	1764	1154	145		1299
9	1154	369	1523	1023	105		1128
10	1018	264	1282	909	83		992
11	892	219	1111	838	73		911

[a] Due to both diffuse and direct solar radiation
[b] This is the *Direct-to-Load* component

The cycles of individual current balances (heat balances) largely tell their own story of the interplay of heat-transfer and heat-storage phenomena. Note particularly the following five points.

1. The resultant convection currents (system load) due to transmitted solar radiation of Fig. 9 are of especial interest. In both cases they lag the peaks of the solar-radiation currents by approximately three hours and the peak convection currents are 75 and 80 percent of the peak radiation currents for Cases I and II.

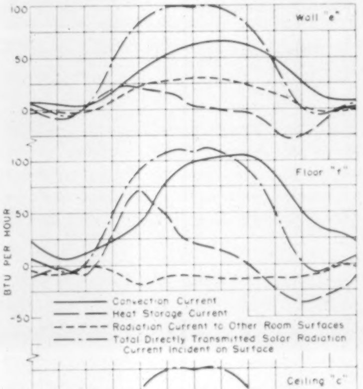


Fig. 8—Thermal currents for Case II — Glass Block — Phase B only

2. Note that even at midnight the system load is 20 to 25 percent of the peak

load. This, of course, is due to the release of stored heat, indicated by the negative rates of heat storage shown in Fig. 9 between the hours of 4:00 p.m. and 4:00 a.m. in both Case I and Case II.

3. Figs. 7 and 8 show that the low temperature radiation exchange is from the other room surfaces to the floor, that is, the floor is the coolest surface. The floor absorbs nearly as much radiation per unit area as the other room surfaces, but its higher convection conductance prevents it from reaching temperatures as high as those of the others.

4. The net heat balance on all interior surfaces gives no net flow through these surfaces throughout a 24-hr period. However, in this period there is a small flow from the room to the outdoor environment through the glass and through the exposed wall *h*. Had phases A and B been solved together, this current flow would have appeared as a reduction in the heat conduction through the glass from the warmer outdoors to the room. For Case I, separate curves have been shown. Because of the low thermal resistance, the heat flow out through the glass is nearly 8 percent of the total input. (This is discussed in Appendix C.) Because of the high thermal resistance of the wall and the glass block and the smaller transmitted radiation, this flow is very small in Case II. The sum is represented by a single curve in this instance.

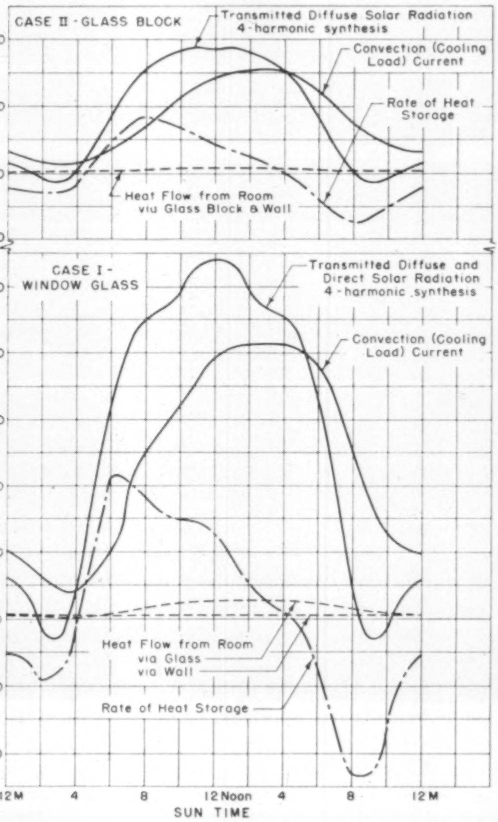


Fig. 9—Resultant convection (cooling load), heat storage and heat-flow-from-room currents compared with transmitted solar radiation for Phase B only — *Note:* Direct-to-Load solar radiation currents are excluded

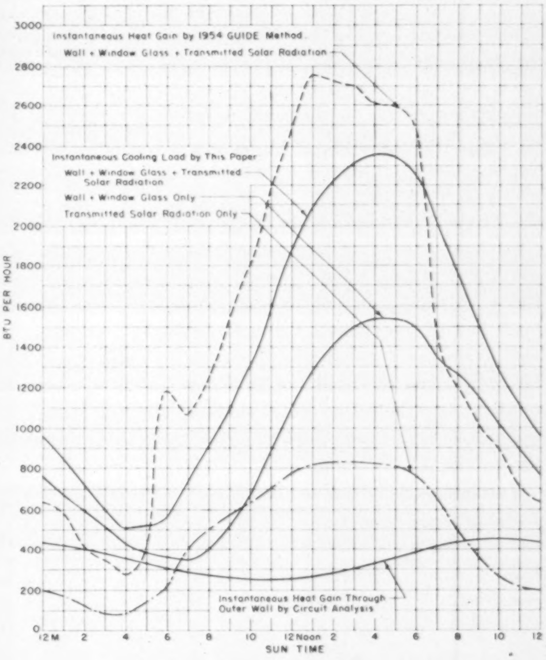


Fig. 10—Instantaneous cooling loads compared with instantaneous heat gains: Case I — Window Glass

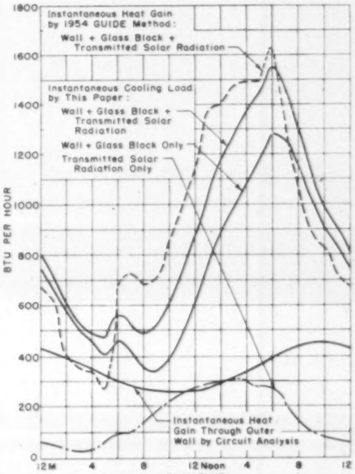


Fig. 11—Instantaneous cooling loads compared with instantaneous heat gains: Case II — Glass Block

5. The reduced transmission from glass block shows up strongly.

Total System Load: Figs. 10 and 11 give the total resultant cooling loads by combining the Phase A results of the previous paper and the load curves of Fig. 9. The small direct-to-load component of Case II is also included in Fig. 11. The values are also listed in Table 2. In both cases the load peak of Phases A and B together occurs at the same hour as the Phase A load peak despite the fact that the Phase B results peak about 2 hr earlier. This is because the Phase A conditions are the principal load producing factors for this north orientated room. Though the Phase A results do not separate the load due to conduction through the wall from the load due to the glass being warmed by both the sun and outdoor air, the warm glass surface appears to be the dominant contributor to the total cooling load.

Instantaneous Cooling Load and Instantaneous Heat Gain: In the absence of methods of treating internal heat storage, common practice is to consider the instantaneous rates of heat gain, such as those given in The Guide, as instantaneous cooling loads. Hence, the synthesized radiation curves of Fig. 9 represent cooling load by this standard. In this particular example, the instantaneous gain method overestimates the load due to the transmitted radiation component and gives an earlier time for the peak load.

Recently a similar circuit was analyzed by Mackey and Gay[2] with a hydraulic analogue. With comparable ratio of glass to floor area but with a *south* exposure, the peak cooling load was found to be about 50 percent of the peak instantaneous rate of heat gain and occurred about 2 hr later. This compares with 75 to 80 percent and a 3-hr time lag in the present paper for the north-exposure room. The reason for the differences, particularly the relative amplitudes, may be due to the more rapid rate of increase in the south wall solar radiation curve.

Figs. 10 and 11 compare the total instantaneous cooling loads with the total instantaneous heat gains. These values are listed in Table 3. In Case I the peak load occurs 3 hr later than the peak gain and is 15 percent less. In Case II the result is different in that the peaks occur at the same time and the total peak load is only 5 percent less than the peak instantaneous gain.

The total instantaneous gains listed in Table 3 and plotted in Figs. 10 and 11 were prepared as follows. The heat flows through the exposed north wall as given in Table 3 were computed in accordance with Equation 5 of Chapter 12 of The Guide 1952. The sol-air temperatures used were those given by Fig. 4 of Reference 1. Convection and radiation gain values for single glass and for glass block were taken directly from Tables 17 and 24, respectively, of Chapter 12 of The Guide 1952 and multiplied by 65 sq ft to obtain the C & R values listed in Table 3. Note that these tables are based on 75 F indoor temperature, the same condition postulated for this illustrative problem. (The 1952 values were used in order to be consistent with the first paper, which was prepared in 1953 when only The Guide 1952 was available.) The heat flow rates due to transmitted solar radiation are simply the sums of the direct and diffuse components given by the curves of Fig. 3. The preparation of these data was discussed earlier in this paper. The total instantaneous gains shown in Figs. 10 and 11 are the sums of these three heat gain components.

Table 3—Instantaneous Heat-Flow Rates for Illustrative Problem

	Heat-Flow Rates — Btu per Hour						
Sun Time	Outer Wall Total	Single Glass C & R	Single Glass Transmitted	Wall & Single Glass Total	Glass Block C & R	Glass Block Transmitted	Wall & Glass Block Total
12 Mn	520	117	0	637	156	0	676
1 a.m.	531	52	0	583	91	0	622
2	377	33	0	410	33	0	410
3	345	0	0	345	13	0	358
4	321	−46	0	275	13	0	334
5	301	−65	131	367	−65	27	263
6	281	0	905	1186	130	236	647
7	257	0	806	1063	195	273	725
8	246	130	891	1267	130	306	682
9	246	325	969	1540	130	332	708
10	235	520	1040	1795	260	358	853
11	224	845	1110	2179	390	377	991
12 N	235	1105	1140	2480	520	384	1139
1 p.m.	345	1300	1110	2755	650	377	1372
2	321	1365	1040	2726	715	358	1394
3	301	1430	969	2700	845	332	1478
4	345	1365	891	2610	845	306	1496
5	377	1300	806	2583	845	273	1495
6	421	1170	905	2496	975	236	1632
7	465	845	131	1441	845	27	1337
8	487	715	0	1202	585	0	1072
9	498	520	0	1018	390	0	888
10	509	384	0	893	320	0	829
11	487	220	0	707	234	0	721

General Comments

Possible Correction Factors to Instantaneous Heat Gain: The present results are limited, but it appears promising to take the instantaneous load as some percentage of the instantaneous gain as computed from data in The Guide. However, because the Phase B results alone give substantially the same time lag and nearly the same ratio of peak load to peak gain for both cases, whereas this is not true when the Phase A and Phase B results are considered together, it appears that percentages should be applied to load components. A method of adjusting instantaneous rates of heat gain in residences for heat storage, based on analogue computer studies, is given in the recent paper by Willcox, et al[3]. It is apparent that much more study of typical circuits and particularly of the separate effects of load-producing components is needed. With respect to the effects of internal heat storage on loads, one can expect that spaces cooled by circulated air alone will differ considerably from spaces cooled by air and cool panels. The present problem indicates the importance of using shading devices, but the fact that interior shades can reach rather high temperatures and convert much of the radiation component to convection must be taken into account.

Though circuit analysis indicates that significant reduction factors on instantaneous heat gain rates with consequent reduction in size of equipment are in order, further reduction in size of equipment can also be made by allowing the indoor temperature to rise at the peak. Circuit analysis principles provide an excellent tool to study this and other operating procedures.

Infiltration: Note that infiltration is considered to be an instantaneous load, added directly to the system load in Fig. 2. Within the uncertainties of infiltration, this is judged to be reasonable.

Fourier Series Treatment: The burden of detailed calculations in the solution of circuit problems by the equation method, as employed in this study, arises from the need to consider several Fourier-series harmonics. Present experience suggests that no more than four harmonics will be needed in practical problems. Judgment rests upon the shapes of the input cycles, — the nearer these are to sine waves, the fewer the needed harmonics.

The accuracy to which a harmonic analysis or synthesis *should* be carried depends upon the purpose involved. Detailed study of temperature and heat-flow cycles requires more harmonics than does a gross study of system load. Referring to Fig. 4, the gain from four to ten harmonics is seen not to be worth the effort in the present case. The four-harmonic synthesized input curve of diffuse radiation, for Case I, for example, makes the sun rise at about 3:30 a.m. whereas the correct time of sunrise is 4:30 a.m. (see Fig. 3). Moreover, it introduces a radiation current during the night hours that oscillates between a positive 100 Btu per hour and a negative 55 Btu per hr. Additional harmonics improve the representation of the true cycle, but for the north exposure, the departures from the behavior of a real physical system are not serious.

It should be noted that the addition of harmonics to the 24-hr average or steady-state value changes only the shape of the curve but does not change the net area under the curve. Furthermore, the net area under a curve synthesized by adding any number of harmonics equals the area under the curve which has been "analyzed". That is, the areas under the synthesized diffuse solar radiation curves of Fig. 4*a* are exactly equal to the area under the diffuse solar radiation curve for window glass given in Fig. 3.

It is probable that all cases where such discontinuous functions are involved will require a considerable number of harmonics for proper representation. It should be noted that the radiation input from lights which are on only part of the day would be a discontinuous or step-wave input function. In contrast to this, harmonic representations of sol-air temperatures require relatively few harmonics because such functions oscillate continuously throughout the 24-hour cycle.

More experience will give a basis for generalizing and simplifying the series analysis.

Further Work

The really lasting value of the present study is the further demonstration and validation of the circuit method for continuing work in load analyses, control studies, and all types of structural and equipment problems wherein the *system* effect of any variable is needed. This viewpoint is very important for economic analyses, wherein the importance of a particular quantity (resistance, capacitance, potential, or current) is related to the expenditure connected with a change or control of its cyclic magnitude. The system problems of automatic controls, in particular, can be properly studied only with some form of circuit analysis.

The next step needed is an analysis of the same room with different exposures, and then of the same room but located directly under a roof. Shading devices also should be studied.

It is entirely possible that sufficient experience in the load-estimating use of circuit analysis will lead to a simple and practical classification of structures, with factors which will correct the load estimating method as given in THE GUIDE to an actual equipment-selection basis. This thought also enters via the work of others[2,3].

Complicated systems, wherein the value of the results warrants the cost, perhaps are best handled on an *analogue*. The ASHAE has taken steps in this direction through sponsorship of a cooperative project at the University of California, Los Angeles, and the appointment of a Coordinating Committee on Thermal Circuit to advise concerning an analogue at the ASHAE Research Laboratory.

Conclusions

1. The practical value of circuit methods for analyzing air-conditioning loads has been further demonstrated in an illustrative example.
2. For a north-exposed room, the peak instantaneous cooling load due only to solar radiation transmitted through a window was found to be 75 percent of the peak instantaneous heat gain and to occur 3 hr later.
3. Continuing work is essential both to realize the full potentialities of circuit analyses and to simplify the solution of problems.

References

1. ASHVE Research Report — Circuit Analysis Applied to Load Estimating, by H. B. Nottage and G. V. Parmelee (ASHVE JOURNAL SECTION, *Heating Piping & Air Conditioning*, June 1954, p. 157).

2. Cooling Loads from Sunlit Glass and Wall, by C. O. Mackey and N. R. Gay (ASHVE JOURNAL SECTION, *Heating Piping & Air Conditioning*, August 1954, p. 123).

3. Analogue Computer Analysis of Residential Cooling Loads, by T. N. Willcox, C. T. Oergel, S. G. Reque, C. M. ToeLaer, and W. R. Brisken (ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, October 1954, p. 149).

WHAT ODORS

By T. H. Urdahl,* Washington, D.C.

DEPENDING upon inflection this expression may be one of pleasure or dismay or merely a question. As engineers we are concerned with the question: What Odors, — can we measure odors, and what do we do about odors.

Odors cause a disturbance and can be generally classed as good and bad. We need have little concern about good odors except as they contribute to the solution of a complex problem — the workings of the human sense of smell. Odor is a problem because so little is known about its basic behavior and that of the human sensing mechanism. It has long been recognized as a problem but only through developments toward ever increasing human efficiency has this problem attained a proportion to command attention. Modern structures with mechanically regulated environment have emphasized odors as an engineering problem. Many in both the medical and engineering professions have recognized odors as a problem over the past two centuries and have variously interpreted effects on persons and prescribed methods of dealing with odors.

Members of ASHAE have contributed from time to time to the correction of misconceptions and a scientific evaluation of the physiological effects of odors. Notable among them is Dr. C.-E. A. Winslow, New Haven, Conn., a past president, whose summation of odors and health ("Fresh Air and Ventilation" — 1926) concludes "............ an atmosphere laden with offensive odors is not only objectionable on aesthetic and economic grounds, but may under certain circumstances constitute a real menace to public health."

The membership of this Society has indicated its interest in providing more definite data concerning the influence of engineering design factors on control of odors. Accordingly a TAC under the Committee on Research has been functioning for the past six years.

A quick analysis might develop the following: Keep equipment clean. Borrow a conclusion from the hound — keep the air dry. There seem to be no scents to follow on a crisp, cold, dry day. On a warmer more humid day there are almost too many. Cleanliness is comparative and the hound's sense of smell is certainly different in many ways from us humans.

The problem is more complex. Its true solution lies along medical, physiological, biochemical and psychological lines — not engineering. The only known odor measuring and classifying device is the human nose and its complex olfactory system. More must be known about the workings of this system. Toward attempting the solution of this problem your committee has divided the research effort into two parts: (1) Physiological, (2) Psychrometric.

Since the first part lies entirely outside the engineering field the Society has undertaken the stimulation of the various medical and chemical groups who have been conducting research on factors relative to the olfactory problem. This has not been easy. A subcommittee of the TAC worked hard for two years under the Chairmanship of George Meek, New York, N. Y., and arranged a Basic Odor Research Condition Conference under the joint auspices of the New York Academy of Science and the ASHAE in April 1953. In addition to planning the program and arranging for papers, several members of the committee took part in this very successful meeting. A complete report of this conference is contained in the Annals of the New York Academy of Science Vol. 58, Article 2, March 24, 1954. The following quotation from the introduction by Capt. A. R. Behnke (M.C.) U.S.N., might stimulate the reader to study this report in its entirety.

"............ The real experimental advances in olfaction, however, only became possible after the major zoological discovery of 1962. The old reactor submarine Nautilus, operated by the Pan-American Science Clubs, ran upon and caught unharmed several specimens of Carcinius urdahlis var. antiquarius, coll., Old Sea Crab (Fig. 1.)."

The second part, or psychrometry of odor effect is well within our sphere of activity and is under way in the Society's Laboratory in Cleveland toward determining by experiment the effects of temperature and humidity upon odor intensity — permeance and persistence using stimulants of the commonly encountered food, tobacco and body odors.

This work has just begun, there are no conclusions yet, but indications are exciting to say the least. These beginnings will have far reaching consequences of great value to our profession and the public if continued and supported by the interest demonstrated through the past "trying" years of "getting this show on the road."

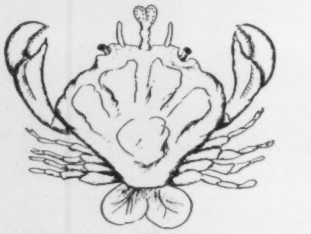
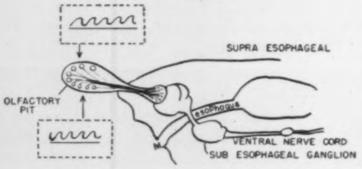


Fig. 1 — Carcinius urdahlis var. antiquarius (Old Sea Crab)



The bilobed olfactory end organ, with nine receptors reacting specifically to nine groups of primary odorants. The lower diagram shows the sinusoidal wave recorded from a single primary unit responding to odorants having the surrealist configuration. The supra esophageal ganglion, the sub esophageal ganglion, the ventral nerve cord and the esophagus are also shown.

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*Chairman, ASHAE Research Technical Advisory Committee on Odors.

Research Committee Announces ASHAE Laboratory Promotions

It has been announced by R. S. Dill, chairman of the Committee on Research, that C. M. Humphreys has been promoted to Assistant Director of Research and that three other members of the Laboratory staff also have been promoted.

C. M. Humphreys

Other advancements include G. V. Parmelee, from Research Associate to Senior Research Supervisor; L. F. Schutrum, and R. G. Huebscher, from Research Engineers to Research Supervisors.

C. M. Humphreys, the author of numerous papers on Design Temperature and co-author of other ASHAE papers, was graduated from Ohio State University in 1925 with a degree in Mechanical Engineering.

From 1925 to 1931 Mr. Humphreys, who is a licensed professional engineer in Pennsylvania and Ohio, was state architect and engineer in Columbus, Ohio. In 1931 he went with the Carnegie Institute of Technology in Pittsburgh as assistant professor of Mechanical Engineering, remaining there until he came with the Society in 1945.

G. V. Parmelee

L. F. Schutrum

G. V. Parmelee was graduated from Fenn College in 1933 with a B. S. in Mechanical Engineering. Mr. Parmelee continued graduate study at Iowa State College and also taught as Assistant Professor of Mechanical Engineering at Fenn College from 1938 to 1945, when he joined the Laboratory staff. He received his master's degree in Mechanical Engineering from Case Institute of Technology in 1945.

Mr. Parmelee is a licensed professional engineer in Ohio and the author of many ASHAE papers. In 1953, on a leave of absence from the Laboratory, he spent some time in Israel serving with the United Nations Technical Assistance Mission.

R. G. Huebscher

L. F. Schutrum served with the U. S. Army Signal Corps during World War II. He attended Fenn College, receiving his B. S. in Mechanical Engineering in 1948. He has been a member of the Laboratory staff since then and is the co-author of ASHAE technical papers.

R. G. Huebscher, also a graduate of Fenn College, received his B. S. in Mechanical Engineering in 1943. Mr. Huebscher is a licensed engineer in the state of Ohio and a member of the Laboratory staff since 1948. He has been on a leave of absence from the Laboratory to the U. S. Naval Medical Research Hospital, Bethesda, Md., since 1953 and will return to ASHAE late in 1955.

Summary of Chapter Meetings*

• *ARIZONA*: The following officers were elected to serve the Arizona Chapter during 1955: *President* — W. A. Biddle; *Vice President* — J. P. Sorensen; *Secretary* — E. P. Maxwell; and *Treasurer* — J. J. Vargo. A motion was approved at the December meeting to make the president a member, and vice president, an alternate member of the Chapters Conference Committee.

J. L. Taylor presented H. H. Green, Air Research, Los Angeles, who spoke on the *Air Conditioning of Aircraft*. Attendance 14. Attendance ratio 0.49.

• *ARKANSAS*: More stringent enforcement of venting regulations is needed to safeguard the health and property of gas users, according to C. E. Blome, education director, William Wallace Co. Mr. Blome gave a detailed discussion on *Gas Appliance Venting* at the December meeting.

Election results were as follows: *President* — W. J. Franklin; *Vice*

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Journal Section

50-Year Members Honored At Annual Meeting

Three Society members, who have attained the distinction of being members 50 years or more, were appropriately honored at the Annual Banquet in Philadelphia last month when Pres. L. N. Hunter awarded them scrolls marking this milestone.

S. R. Lewis
Chicago, Ill.

The members cited are S. R. Lewis, Chicago; H. C. Meyer, Jr., New York City; and W. R. Stockwell, Michigan City, Ind. The scrolls express appreciation for their longevity of membership, credit to the profession, and loyal support of the Society.

Mr. Lewis, a member since 1905 and a founder of the Illinois Chapter, served as Society president in 1914 and was a member of Council 1914-1915. Born in 1878, he has been active in the profession since his youth and is the author of many books and technical papers related to the profession and industry.

H. C. Meyer, Jr.
New York, N.Y.

Mr. Meyer joined the Society in 1898 and served on the Council in 1915-1916. Born in 1870, he has worked on numerous buildings throughout the country including the Empire State Building, Yale University and the U. S. Military Academy at West Point. In 1934 he established the firm of Meyer, Strong and Jones, Inc. in New York.

W. R. Stockwell
Michigan City, Ind.

Retired in 1949 as the general manager of the manufacturing division of the Weil-McLain Co., Mr. Stockwell has been active in the profession and industry for many years and has been a member of the Society since 1901. Born in 1875, he was with the old J. H. McLain Co. prior to its succession by Weil-McLain.

Summary of Chapter Meetings *(continued)*

President — J. L. Brown; *Secretary* — J. W. Thompson; *Treasurer* — H. H. Himstedt; *Board of Governors* — J. C. Lewis, Fred Tenny, C. H. Miller, R. H. Combs, and Luther Granderson, Jr. Attendance 16. Attendance ratio 0.19.

• *ATLANTA*: B. S. Breitman, sales manager, American Hydrotherm Corp., Long Island City, N. Y. spoke in December on the application of hot water at temperatures above 240 deg to district heating. Mr. Breitman illustrated with slides showing typical installations and diagrams of systems. Attendance 44.

• *CENTRAL OHIO:* A joint meeting with the Columbus Technical Council held in November featured a talk on *Atomic Energy* by H. N. Alyea, professor of chemistry, Princeton University. The speaker attracted 40 members and 68 guests. Attendance 108.

• *EMPIRE STATE CAPITAL*: A *Construction Outlook and Forecast for 1955* was given in December by Emmett Burdick, district manager, F. W. Dodge Corp., Buffalo, N. Y. He pointed out that contract awards are at an all-time high level, and indications reveal the same high level for 1955. Pres. E. C. Doyle introduced Mr. Burdick, who was bombarded with questions following his talk. Attendance 50. Attendance ratio 0.71.

• *ILLINOIS*: Proposed revision of the Chicago Ventilation Code stirred considerable interest among Illinois Chapter members so that they devoted the November meeting to a panel discussion on this subject with E. P. Heckel acting as moderator.

Mr. Heckel defined the requirements of a reasonably good city code as *fair, just, purposeful, logical and practical* pointing out that it should not incur undue cost to owner, builder, architect, consulting engineer or contractor. The panel included J. J. Aeberly, chief of Bureau of Heating, Ventilating and Industrial Sanitation, City of Chicago; S. I. Rottmayer, Samuel R. Lewis & Associates, Chicago; and Rudy Houkal.

S. R. Lewis, a Life Member himself, presented a Life Membership certificate to W. T. Walters. Attendance 167.

• *INLAND EMPIRE*: *Air Conditioning in Muggy Weather* was the subject for discussion at the Novem-

ASHAE Regional Meeting in Oklahoma City April 14-16

An ASHAE Regional Meeting, consisting of two technical sessions as well as a meeting of the Council, will be held in Oklahoma City, Okla. on Friday and Saturday, April 15, 16, 1955 in the Skirvin Hotel. Various committee meetings will be held Thursday, April 14. A dinner and Get-Together Party are scheduled for Friday evening and the banquet will be Saturday evening.

The general chairman of the committee on arrangements, which is made up of members from the Oklahoma Chapter, is W. J. Collins, Jr. and the vice chairman is G. T. Donceel.

Mr. Collins has announced the following committee chairmen have been appointed:—Banquet and Entertainment, F. X. Loeffler, Jr.; Registration and Reception, M. K. Cohenour; Finance, A. C. Shelley; Transportation, J. H. Carnahan; Publicity, E. W. Gray; Sessions, J. R. Patten.

Several papers will be presented at the technical sessions which will be held on Saturday morning and afternoon.

Oklahoma City has many points of interest. It is the home of the state capitol, which is the only capitol in the world with producing oil wells beneath it. The building itself is surrounded by these oil wells and its other distinguishing mark is that it is the only capitol in the nation which has no dome. Running the capitol a close second in interest is the Historical Society Building, nearby the capitol, which contains Indian archives surpassed only by the Smithsonian Institution.

TENTATIVE PROGRAM
ASHAE REGIONAL MEETING
Oklahoma City, Okla., April 14-16, 1955
Skirvin Hotel

Friday, April 15

9:00 a. m.	Council Meeting
2:00 p. m.	Registration
7:00 p. m.	Get-Together Dinner

Saturday, April 16

9:00 a. m.	Registration
10:00 a. m.	Technical Session
12:15 p. m.	Luncheon
2:00 p. m.	Technical Session
6:00 p. m.	Social Hour
7:00 p. m.	Banquet

Summary of Chapter Meetings *(continued)*

ber meeting. J. E. Wakefield introduced the speaker, D. D. Wile, chief engineer, Refrigeration Engineering, Inc., Los Angeles, who emphasized the importance of the control of humidity in comparatively dry climates, particularly in mild weather when only light loads are required.

R. D. Nevers, publicity chairman, reported that local publications seem to take an active interest in Chapter activities. Attendance 45. Attendance ratio 0.38.

• *KANSAS CITY*: Reports given at the December meeting included those by R. B. Luhnow, Jr. of the Technical Advisory Committee; A. A. Zahner, Vocational Guidance; and G. F. Hellmer, Membership Committee, who urged eligible members to make application for advancement.

A. S. Hurt, Jr., vice president, introduced F. N. Stevens, Midwest Research Institute, Kansas City, who gave a general outline of the activities of the Institute and described the method of solving heating and air conditioning problems. Attendance 69. Attendance ratio 0.26.

• *MANITOBA*: A clear picture of what to expect in the selling of gas appliances was given at the November meeting by A. J. Strain, general manager, Ruud Manufacturing Co., Mimico, Ont. A. W. Moss introduced the speaker. Several interesting questions followed the presentation, and F. W. Satchwill, sales manager, Winnipeg Central Gas Co., joined in the replies. Attendance 27.

• *MASSACHUSETTS*: Society President L. N. Hunter attended the October meeting of the Massachusetts Chapter, giving the seventy-one members and eleven guests present the benefit of his informative talk on *The Rating of Heating Boilers.* Attendance 82.

• *MASSACHUSETTS*: R. E. Radabaugh, General Electric Co., spoke in November on the *Application of Motors to Fans.* Attendance 78.

• *MICHIGAN*: The joint *ASRE*-ASHAE meeting held at the *Engineering Society of Detroit* in December attracted a large audience. At the dinner meeting, H. A. Clark, vice president and sales manager, Michigan Consolidated Gas Co., discussed the forthcoming use of natural gas in Michigan in his talk on *The Future of Gas for Heating and Air Conditioning.*

Later, A. I. McFarlan, president, A. I. McFarlan, Inc., New York, N. Y. addressed an audience of 150 in the auditorium, on *More Tonnage for Less Horsepower*. Attendance 120.

• *MINNESOTA*: *The Exchanger*, Minnesota Chapter publication, is dependent upon sponsors, reported Editor C. H. Johnson, Jr. when asking for volunteer sponsors at the December meeting.

Pres. J. A. Craig announced that the Chapter Planning Commission had been formed to study the operations of the Chapter and make recommendations to the Board of Governors at the beginning of each year.

After termination of the business meeting, J. S. Locke presented R. H. Groman, director of applied welding engineering, Eutectic Welding Alloys Corp., Flushing, N. Y. who suggested the advantages of low-temperature welding.

• *MONTREAL*: *What Is Wrong with Air Conditioning* — The Design? The Equipment? The Installation? The Customer? A panel selected to consider this problem at the October meeting included four Montreal members representing various viewpoints. M. H. Kert, consulting engineer, James P. Keith and Associates, analyzed the problem from the engineer's position; D. J. McIntyre, district manager, Canadian Sirocco Co., Ltd., spoke for the equipment supplier; B. J. Horsburgh, branch manager, Johnson Temperature Regulator Co. of Canada, Ltd., for the controls equipment; and Roger des Trois Maisons, vice president, Ernest Le Blanc, Ltd., for the contractors. The ensuing discussion was tape recorded to help prepare a report on the subject.

Pres. D. L. Lindsay told of the meeting of Ottawa, Toronto and Montreal Chapter representatives to discuss the recommendations of the Chapter Relations Committee at Swampscott. In accepting his Life Membership certificate, G. H. Osborne described the great value of Society membership. Attendance 102. Attendance ratio 0.39.

• *NEW MEXICO*: After explaining the 300-ton heat pump system which he designed, F. H. Bridgers, Bridgers & Paxton, Consulting Engineers, Albuquerque, guided an inspection of this installation at the 12-story Simms Building. R. W. Haines, treasurer, presided at the November meeting. Attendance 51.

• *NORTH JERSEY*: Pres. H. M. Patrick congratulated the turnout for the December meeting since it was an exceptionally bad evening. Featured was a talk by W. P. Chapman, engineering sales service representative, Pittsburgh, on *Research Developments — Snow Melting*. Considerable discussion followed this presentation. Attendance 58. Attendance ratio 0.34.

• *NORTH TEXAS*: Vice Pres. J. W. James, Chicago, was introduced to the membership at the November meeting by Ross Zumwalt. Advice offered by Vice President James was to *Give the Public What They Need*. He emphasized his major points with slides.

D. C. Kieffer announced that $624 had been raised for the Polio Fund, and T. H. Anspacher reported $750 collected to date for the Giesecke Memorial Fund. The nominating committee, under the chairmanship of J. A. Bishop, presented a slate of officers for 1955. Attendance 85. Attendance ratio 0.34.

• *NORTHEASTERN OKLAHOMA*: New officers introduced at the December meeting were as follows: *President* — J. T. McKinney; *Vice President* — J. D. Ryan; *Secretary* —G. A. McCune; *Treasurer* — H. W. Meinholtz; *Board of Governors* — R. W. Winget, J. R. Shipman and H. L. Cauvel.

C. W. Nessell, account executive, Minneapolis-Honeywell Regulator Co., Chicago, gave a highly interesting report on some of the residential air-conditioning jobs investigated by the field research committee of the NWAH&ACA. Attendance 33. Attendance ratio 0.41.

• *NORTHERN PIEDMONT*: Society Pres. L. N. Hunter was presented in November by Chapter Pres. R. B. Crosland, Jr. President Hunter advised the group concerning the activities of the Society, and gave helpful information on *The Rating of Heating Boilers*.

Northern Piedmont Members get together with President Hunter. (*l.* to *r.*) Harry Hoffman, Sr., R. B. Crosland, Jr., J. E. Hart, President Hunter

Northern Piedmont Chapter Host to Pres. L. N. Hunter. (*l.* to *r.*) S. T. Oliver, Prof. F. J. Reed, R. B. Crosland, Jr., President Hunter, G. H. Ficken

Semi-Annual Meeting 1955

In San Francisco — June 27-29

Seemingly a long way off at this time of year, the Semi-Annual Meeting of the Society, which will be held June 27, 28, 29, 1955 in San Francisco, is already taking shape. S. W. Terry, general chairman of the Committee on Arrangements, reports that the committee chairmen have been appointed and that they have been busy securing volunteers to serve on the various committees.

The meeting will be held at the St. Francis Hotel, with the first technical session opening Monday morning, June 27. Early visitors to the West Coast city can plan on using the week-end for sight-seeing and many of the other pleasant diversions offered by San Francisco. Still other members may build their vacation around the Semi-Annual Meeting and either extend their visit in San Francisco or travel by car to see as much as they can between their home city and the Golden Gate.

Mr. Terry has announced that H. Duncan will serve as vice chairman and that G. M. Simonson is honorary chairman. The toastmaster for the banquet will be Dr. B. M. Woods, past president of ASHAE and vice president, University Extension, University of California.

Committee chairmen are: Banquet, N. H. Peterson; Entertainment, J. I. Sprott; Reception, T. J. White; Transportation, K. K. La Point; Sports, Dudley Deane; Young People, R. C. Pribuss; Finance, K. F. Baldwin, Jr.; Ladies, E. C. Cooley, Jr.; Sessions, D. L. Williams; Publicity, T. Brewer.

Summary of Chapter Meetings *(continued)*

Unanimous election results presented the following slate of officers for 1955: *President* — S. T. Oliver; *Vice President* — L. R. Gorrell; *Secretary* — E. D. Frazier; and *Treasurer* — D. T. Waynick. Attendance 48.

• *ONTARIO*: The membership observed a minute's silence at the December meeting in memory of the late L. L. Anthes, a Life Member of the Society.

A. R. Crozier, gas commissioner for the Province of Ontario, spoke on *Natural Gas in our Community*. This subject was extremely timely since this area is now feeling the impact of natural gas being piped in from the United States, and it is expected that gas will soon be piped in from the Canadian west. Attendance 149.

• *OREGON*: Pres. E. E. Kelly welcomed a score of Pacific Northwest Chapter members to the joint November meeting. Also invited were *ASRE* members and potential members. Pres. E. E. Kelly presided.

Planning Air Conditioning Systems for Comfort on Muggy Days was discussed by D. D. Wile, chief engineer, Refrigeration Engineering, Inc., Los Angeles, who was introduced to the audience by Walter Sonnenberg. Mr. Wile covered various control methods. Attendance 131. Attendance ratio 0.40.

• *OTTAWA VALLEY*: The small beginning of the natural gas industry in western Canada was followed after 1940 by a rush for oil sites, caused by the war and resulting in great natural gas finds. According to the November speaker, A. J. Strain, general manager, Ruud Manufacturing Co., Mimico, Ont., hand in hand with these discoveries came the development of pipe line construction and a quick and easy means of transportation to the large markets. Mr. Strain traced *The Development of the Natural Gas Industry in Canada* and stated that known Canadian reserves are enough for an estimated 50 years with only 5 percent of the estimated reserves discovered today. To the heating contractor, Mr. Strain explained, this means advertising to attract customers to new centers, merchandising with deep thinking, and sticking to well-recognized brand names.

Also at the meeting, G. L. Ostiguy was presented with a past president's pin and a silver tray as a gift from the Chapter. Attendance 40. Attendance ratio 0.57.

• *PACIFIC NORTHWEST*: Old Timers night in October featured a presentation on the history of the early developments in the heating and ventilating field given by S. D. Peterson. Prof. E. O. Eastwood and William Mallis, life members, were introduced.

Vice Pres. I. L. Winsor presented Malcolm McLeod, an attorney who is acting in behalf of the Indian tribes of the northwest to regain the purchase value of the land that was originally inhabited by these tribes. His talk was of interest to all. Attendance 61. Attendance ratio 0.56.

• *ROCKY MOUNTAIN*: Society Pres. L. N. Hunter, Johnstown, Pa. was introduced to the members at the November meeting by Pres. V. F. Vallero. Previous to his major topic, President Hunter briefly described the functions and accomplishments of the Society, and outlined the research activities conducted both through the research facilities of the Society and those projects assigned to various universities.

Journal Section

In his informative talk on *The Rating of Heating Boilers*, President Hunter compared the rating codes of *I=B=R, SBR, AGA*, and *HP&-ACCNA*, describing the factors necessary for consideration in their use. F. C. Allen, Rocky Mountain Chapter vice president, expressed the Chapter's appreciation to President Hunter for his appearance and timely information. Attendance 50.

• *WEST TEXAS*: After the introduction of guests and members at the November meeting, M. J. Aderton presented L. S. Reagan, vice president and general manager, The Webster Engineering Co., Tulsa, Okla., who gave a talk on gas burners. Pres. L. C. McKay praised W. M. Neill and F. S. McLaren for the meeting arrangements. Attendance 32. Attendance ratio 0.33.

• *WISCONSIN*: As guest speaker at the October meeting, Floyd Hasselriss, American Hydrotherm Corp., Long Island City, N. Y. covered various aspects of high temperature hot water systems. According to Mr. Hasselriss, this type of heating dates back about 30 years in Europe. Defining a high temperature hot water system as any system which requires a licensed operator, Mr. Hasselriss stated that the use of high temperature hot water requires special designs of coils to restrict flow and produce the desired large temperature drop.

John W. James, second vice president of the Society, Chicago, Ill. discussed the proposed Society name change. Attendance 87. Attendance ratio 0.30.

Student Branches

• *NORTH CAROLINA STATE COLLEGE*: New officers for the year 1954-55 were announced at the October meeting as follows: *President*—Alvah Ehrman; *Vice President*—S. R. Moore; *Secretary*—R. W. McDonald; and *Treasurer*—C. B. Wiggs.

Unanimous approval was demonstrated for the proposed Society name change. Attendance 25. Attendance ratio 1.00.

• *PURDUE UNIVERSITY*: The Mechanical Engineering Building, Purdue University, was the scene of the November meeting, with Pres. E. B. Katz presiding. Following the business of the meeting, Charles Cosberg, sales representative, National Homes Corp., Lafayette, Ind. conducted a tour through his company. Attendance 18. Attendance ratio 0.54.

• *UNIVERSITY OF DETROIT*: The principal speaker at the October meeting was J. B. Olivieri, chief mechanical engineer, Victor Gruen Associates, Architects and Engineers, Inc., Detroit. He viewed the position of the engineer in the air-conditioning field.

G. H. Williams, field engineer, Carrier Corp., Detroit, who is Michigan Chapter Student Branch committee chairman, spoke on the aims and activities of the Society.

Newly elected officers were introduced: *President*—J. C. Rumpf; *Vice President*—J. T. Pillittere; *Secretary-Treasurer*—L. J. Hayes, Jr.; and Reporter—V. W. Wiktorowski.

SPECIAL SWITZERLAND BRANCH

• *SWITZERLAND*: Persia's water supply and sewage problems were described in November by H. Schellenberg, who was selected by UNESCO to spend a year in Persia for study and consultation. Mr. Schellenberg's impressions and experiences were followed with considerable interest; the slides shown were beautiful; and the audience, including the ladies who were invited, showed appreciation with enthusiastic applause. Attendance ratio 0.70.

H. C. Bechtler

• *SWITZERLAND*: The third annual meeting of the Switzerland Special Branch, held on September 24, included the election of the following officers: *President*—H. C. Bechtler; *Vice President*—John Frei; *Treasurer*—Werner Niederer; *Secretary*—Walter Hausler; and *Auditor*—Werner Gysi. The outgoing officers received thanks for their efforts. President Bechtler advised cooperation with the *Swiss Society of Engineers and Architects* on the organization of lectures, and the members approved this proposal. Attendance ratio 0.65.

Attention!!
Members of ASHAE
Moved or Moving?

Each month mail is returned BECAUSE you overlooked advising us of the change in your address.

The return mail is a loss to you, and an added expense to the Society.

In your own interest, will you please advise us at once of any change in your business or home address, indicating which is your mailing address.

ASHAE Headquarters
62 Worth St.
New York 13, N. Y.

PHILADELPHIA PROMOTION

E. H. Dafter, who previously served as sales engineer, has been appointed Philadelphia branch manager of the Carrier Corp. in the Machinery and Systems Division. In this new assignment Mr. Dafter will assume the responsibility for sales activities pertaining directly to the Philadelphia branch operation.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the Journal of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 122 applications for membership, including 9 student applications and 1 reinstatement; in addition 10 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by February 28, 1955, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Arizona

Wertheimer, Herman, Sales Repr., Utility Appliance Corp., Phoenix. References: B. B. Breslow*, Rudy Harkins*, Leo Hungerford, Richard Peterson.

California

LaGasse, C. D., Sales Engr., Westinghouse Electric Corp., Los Angeles. References: N. N. Dahl, F. W. Jordan, H. P. Sheldon, W. A. Tappendorf.

Loman, R. F., Design Engr., Daniel, Mann, Johnson & Mendenhall, Los Angeles. References: Melvin Kodmur, R. C. Taylor, H. F. Ulovec, Albert Zimmerman.

Singer, J. V., Gen. Mgr., Airfan Engineering Co., Los Angeles. References: L. B. Davenport, D. E. Reznick, M. D. Shafer, C. D. Walz.

Snowden, C. E., Jr., Mech. Engr., Okinawa Engineering Distr., San Francisco. References: O. W. Childers*, J. A. Plater*, A. E. Richmond*, Charles Stanford*.

Colorado

△Krisl, Leo, Mech. Engr., U. S. Bureau of Reclamation, Denver. References: D. D. Pearsall, B. H. Spurlock, Jr., A. S. Widdowfield, H. L. Wray.

Connecticut

△Cahoon, R. B., Sales Engr., Johnson Service Co., New Haven. References: W. B. Hoyt, C. L. L'Hommedieu, M. F. Rather, C. F. Yellin.

Roff, C. T., Plant Mgr., Anemostat Corp. of America, Hartford. References: Fritz Honerkamp, F. J. Kurth, G. R. Wallen, C. M. Wilson.

Florida

Leach, G. D., Jr., Air Cond. Engr., Tampa Electric Co., Tampa. References: J. F. Dailey, S. F. Graziano, G. C. Hall, G. E. Taylor.

Idaho

△Richardson, H. G., Partner, Thermal Engineering Co., Boise. References: S. W. Foulger, E. F. Lessinger, L. E. Marque, E. J. Watts.

Illinois

Abrahamson, Arthur, Engr., Advance Heating and Air Conditioning Corp., Chicago. References: G. W. Bornquist, S. L. Haas, Herbert Kreisman, E. R. Teske.

Blumenthal, R. S., Mech. Engr., Advance Heating and Air Conditioning Corp., Chicago. References: Herman Dubin, William Goodman, Samuel Haas, Herbert Kreisman.

Faltermeier, R. B., Sales Repr., Rheem Manufacturing Co., Chicago. References: Ray Campbell*, G. O. Gibson, R. L. Pennington, Ralph Whitney*.

Goldschmidt, Gideon, Sales Engr., H. S. Kaiser Co., Chicago. References: R. B. Hudson, I. S. Kaiser, J. H. Kaiser, Herbert Kreisman.

Irwin, E. W., Repr., Kewanee-Ross Corp., Chicago. References: C. E. Bronson, J. M. Hartman, W. G. Pennington, N. W. Swanson.

Lazar, J. H., Pres., Refrigeration Systems, Inc., Chicago. References: William Goodman, J. H. Kaiser, Herbert Kreisman, A. R. Wallace.

Leapley, L. E., Field Engr., Air Conditioning Div., General Electric Co., Chicago. References: I. P. Allshouse, F. R. Ellenberger, D. W. Lynch, Justin Neuhoff.

Lebow, J. P., Mech. Engr., Advance Heating & Air Conditioning Corp., Chicago. References: S. L. Haas, J. H. Kaiser, Herbert Kreisman, J. A. Oberlin.

Mautner, H. M., Partner, Mid West Heat Service, Chicago. References: Frederick Breyer, Herbert Kreisman, S. L. Lichtenfeld, E. W. Mautner.

Siva Rao, P. D., Research Asst., University of Illinois, Urbana. References: H. T. Gilkey, W. S. Harris, S. Konzo, E. L. Sartain.

Sokoloff, R. M., Repr., Central States Steel Boiler Co., Chicago. References: R. J. Abramson, G. R. Chadwick, S. L. Haas, Herbert Kreisman.

Indiana

Johnson, J. W., Sales Engr., American Blower Corp., Fort Wayne. References: H. A. Burkart, Jr., E. W. Jaques, J. D. Pressler, G. B. Supple.

Iowa

Jacobson, R. O., Jr., Engr., Stanley Engineering Co., Muscatine. References: W. B. Harris*, M. D. Jones, R. T. Potthoff*, H. D. Ruppel.

Kansas

Ennis, W. D., Vice Pres., Johnson's, Inc., Wichita. References: C. B. Erway*, J. V. Johnson*, Robert Shepard*, K. P. Whitney.

Kentucky

Bader, L. E., Mgr., Industrial Insulation Dept., Fiberglas Contracting & Supply Co., Louisville. References: Bud Drake*, Bill Frex*, Cliff Lewis*, George Miller.

Craig, R. L., Sales Engr., Continental Air Filters, Inc., Louisville. References: J. A. Craig, W. K. Dyer, S. E. Fenstermaker, Jr., G. V. Sutfin.

Emison, S. S., Sales Engr., Continental Air Filters, Inc., Louisville. References: A. F. Hinrichsen, R. E. Mason, A. G. Mutimer, G. V. Sutfin.

Gonzalez, D. J., Staff Asst. to Chief Engr., American Air Filter Co., Inc., Louisville. References: H. G. Gragg, J. M. Kane, J. H. Milliken, Arthur Nutting.

O'Dell, L. J., Dvlpt. Engr., American Air Filter Co., Inc., Louisville. References: J. M. Kane, J. W. May, H. J. Noles, Arthur Nutting.

Roberts, C. J., Repr., The Trane Co., Louisville. References: R. G. Lubinsky, A. C. Menke, N. H. Peterson, C. L. Ringquist.

Saufnauer, D. E., Field Supvsr., Barber-Colman Co., Louisville. References: E. L. Aken, V. P. Hansen, D. E. Horock, L. C. Plaehn.

Sexton, R. W., Sr., Research Engr., American Air Filter Co., Inc., Louisville. References: John Hellstrom, J. M. Kane, J. W. May, Arthur Nutting.

Louisiana

Ballanco, A. S., Mgr., Air Filter Sales, Reilly-Benton Co., Inc., New Orleans. References: Ralph Elizardi, J. E. Leininger, A. F. Lusch, O. F. Schully.

Flick, L. A., Repr., Southern Heater Co., New Orleans. References: H. L. Flettrich, H. N. Stall, G. E. Sullivan, E. O. Thoman.

Journal Section

FORDE, R. H., Engr., Ogden & Woodruff, Cons. Engrs., Baton Rouge. REFERENCES: A. J. Mayers, Jr., H. N. Ogden, B. M. Payne, C. S. Woodruff.

FRANKLIN, W. A., Distr. Engr., Frigidaire Sales Corp., New Orleans. REFERENCES: J. F. Albright, Jr.*, C. C. Armstrong*, Walter Cooke, I. A. Lindberg, Jr.

GUYNN, G. M., Office Mgr., Airtrol Engineering Co., Baton Rouge. REFERENCES: Raymond Goode, W. J. LeBlanc, W. I. Pol, C. S. Woodruff.

JONES, J. P., Design Engr., Ogden & Woodruff, Cons. Engrs., Baton Rouge. REFERENCES: W. J. LeBlanc, A. J. Mayers, Jr., B. M. Payne, W. I. Pol.

MARINO, S. F., Owner, Marino and Son, Baton Rouge. REFERENCES: W. J. LeBlanc, A. J. Mayers, Jr., W. I. Pol, C. S. Woodruff.

MILLER, W. J., Partner, Goodman & Miller, Baton Rouge. REFERENCES: R. H. Goodman*, A. W. Holland, J. F. Naylor, H. J. Weilbacher.

RABUN, J. L., Vice Pres., Leningston Supply Co., Inc., Baton Rouge. REFERENCES: W. J. LeBlanc, A. J. Mayers, Jr., J. F. Naylor, Jr., H. N. Ogden.

RESTER, W. W., Owner, Rester Refrigeration Service, Baton Rouge. REFERENCES: G. S. Cox, W. J. LeBlanc, A. J. Mayers, Jr., C. S. Woodruff.

TUCKER, G. W., Design Engr., Ogden & Woodruff, Cons. Engrs., Baton Rouge. REFERENCES: W. J. LeBlanc, H. N. Ogden, B. M. Payne, C. S. Woodruff.

VINCE, SAM, Owner, Vince Plumbing & Heating Co., Baton Rouge. REFERENCES: A. W. Holland, W. J. LeBlanc, A. J. Mayers, Jr., W. I. Pol.

Massachusetts

BLAIR, W. R., Repr., Monitor Controller Co., Boston. REFERENCES: L. R. Geissenhainer, F. A. Merrill, W. H. Shipp, E. M. Tracey.

COUTURE, R. E., Sales Engr., Filters, Inc., Somerville. REFERENCES: Fritz Honerkamp, L. B. Mann, J. M. Means, B. H. Snow.

CROWLEY, L. J., Cons. Engr., Boston. REFERENCES: G. E. Fickett, J. A. Ivester, J. M. Means, W. H. Shipp.

FERRARO, F. A., Mgr., Buerkel & Son, Inc., Springfield. REFERENCES: F. J. Butler, J. H. Colby, R. E. Cross, D. C. Miller.

△HARE, A. L., Br. Mgr., Kewanee-Ross Corp., Boston. REFERENCES: R. T. Kern, B. H. Schulze, L. E. Seeley, R. G. Vanderweil.

KING, R. J., Supvsr., Air Conditioning Dept., Hathaway Manufacturing Co., New Bedford. REFERENCES: Milton Irons*, James Marshall, O. T. Merwin, J. C. Rose.

LEONHARDT, F. N., Partner, The Leonhardt Co., Brookline. REFERENCES: R. E. Borden, Adolph Ehrenzeller, D. C. Miller, H. E. Parker.

LEONHARDT, J. A., Partner, The Leonhardt Co., Brookline. REFERENCES: R. E. Borden, Adolph Ehrenzeller, D. C. Miller, H. E. Parker.

MCGRATH, J. M., Engrg. Drafting Supvsr., Delbrook Ventilating Co., Cambridge. REFERENCES: R. K. de l'Etoile, G. E. Fickett, G. D. Fife, B. H. Snow.

MUNN, C. R., Vice Pres., Punderson Coal Co., Springfield. REFERENCES: T. C. Croft, R. E. Cross, William Jones*, M. B. Ross*.

NERI, ARMAND, Draftsman, Delbrook Ventilating Co., Cambridge. REFERENCES: R. K. de l'Etoile, G. D. Fife, J. A. Ivester, B. H. Snow.

THOMAS, R. C., Sales Engr., Delbrook Ventilating Co., Cambridge. REFERENCES: G. E. Fickett, C. M. F. Peterson, L. E. Seeley, B. H. Snow.

VAN BAARS, J. F., Engrg. Design Draftsman, Delbrook Ventilating Co., Cambridge. REFERENCES: R. K. de l'Etoile, G. D. Fife, C. M. F. Peterson, B. H. Snow.

Michigan

†HERBERT, R. M., Chief Engr., Primor Products, Inc., Adrian. REFERENCES: H. G. Hays, C. A. Reichelderfer, K. W. Schick, T. H. Smoot.

KRUGGEL, G. F., Instructor, Michigan College of Mining & Technology, Houghton. REFERENCES: E. W. Niemi*, T. M. Saklin, F. E. Wittig, A. P. Young*.

LORION, C. G., Designer, Heating Equipment Co., Detroit. REFERENCES: F. G. Bolle, Jr., L. N. Green, J. M. Lieber, J. E. Turner.

Minnesota

LANGE, G. W., Sales Engr., Mechanical Service Co., Minneapolis. REFERENCES: C. E. Gausman, G. F. Gausman, F. F. Lange, W. F. Westerberg.

Missouri

△HARRYMAN, M. M., Engr., Becklean Co., Kansas City. REFERENCES: D. M. Allen, P. A. Moreno, Paul Shapiro, L. W. Zahner, Jr.

Nebraska

JOHNSON, D. E., Industrial Engr., Metropolitan Utilities District, Omaha. REFERENCES: W. V. Bell, S. W. Black, Charles Holdrege*, Howard Kellogg*.

LIND, A. F., Chief Estimator, Olson Bros., Inc., Omaha. REFERENCES: G. W. Colburn, M. J. Olson, F. E. Prawl, E. C. Webber.

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England

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France

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India

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Thailand

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Turkey

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Antonyshyn, Michael

OBITUARIES

GEORGE F. GOBLASKAS
Worcester, Mass.

The Society was saddened to learn that George F. Goblaskas died on November 21 at the age of 31. Although a member of the Society for less than a year, Mr. Goblaskas had expressed his pride in membership.

Born in Worcester, Mass. on March 7, 1923, Mr. Goblaskas received an associate degree in mechanical engineering from Worcester Junior College in June 1954. Since 1948 he was connected with Tucker & Rice, Inc., as a design draftsman.

Mr. Goblaskas is survived by his wife, who resides at their home in Northboro, Mass.

RICHARD E. HOLMES
Holyoke, Mass.

The sad news has been received of the death of Richard E. Holmes, chief engineer, Air Conditioning and Refrigeration Division, Worthington Corp., Holyoke, Mass. on October 15, at the age of 46. Previous to joining Worthington Corp. in 1950, Mr. Holmes was associated with Westinghouse Electric Corp. since 1928, with the exception of a three-year period of service in the Ordnance Department, U. S. Army. He served as a design engineer in Westinghouse's Pittsburgh and Springfield offices, and later as a section engineer in Boston.

A native of Pittsburgh, Pa., where he was born on February 22, 1908, Mr. Holmes received his B.S. in E.E. from Carnegie Institute of Technology in 1928 and an M.S. in M.E., University of Pittsburgh, 1932. He gave night courses in air conditioning and refrigeration at Westinghouse, Massachusetts University Extension and Northeastern University, and was author of a book on *Air Conditioning in Summer and Winter*. He was a member of *ASRE* and had been a member of the Society since 1934.

Surviving are his wife, Dorothy, and three sons, Robert William, Donald Edwin and Richard Louis.

JOHN B. MacFERRIN
Houston, Tex.

Word has been received of the death of John Bratcher MacFerrin, Pittsburg Appliance Co., Houston, on December 1, 1954.

Mr. MacFerrin was born on January 31, 1890 in Tusculum, Tenn. He took preparatory training at King College, Bristol, Tenn. and received his B.A. from Austin College, Sherman, Tex. in 1911. Joining the United Gas Corp. in 1928, Mr. MacFerrin acted as residential sales director and commercial manager. Thirteen years later he transferred to the Pittsburg Water Heater Sales Co. as heating and ventilating engineer and sales manager.

He was an active member of the Kiwanis Club of Houston, the Houston Sales Managers Club, and the Houston Chamber of Commerce, as well as ten years a member of the Society. His survivors include his wife and a son, J. B. MacFerrin, Jr.

PARK E. SLEISTER
Omaha, Neb.

Park E. Sleister, sales engineer, United Plumbing & Heating Supply Co., Omaha, Neb. died recently at the age of 65. Mr. Sleister operated his own heating, air conditioning and plumbing contracting business intermittently since 1914.

Although born in Manilla, Ia. on July 18, 1889, Mr. Sleister attended school in Armour, S.D. For a number of years he was manager of plumbing and heating departments in Armour and Lyons, Neb. Then, following 17 years with his own business at Fremont, Neb., he served as mechanical inspector at the Nebraska Ordnance Plant, and as sales engineer and field superintendent in various Nebraska locations.

Mr. Sleister had held membership in the *National Association of Power Engineers*, the *National Association of Plumbing Contractors*, and was a member of the Society since 1913. He is survived by his wife.

ALLEN W. WILLIAMS
Columbus, Ohio

Allen W. Williams, 86, a Life Member of the Society, died October 8, 1954. Word was received from the grieving Central Ohio Chapter, of which he was a past president.

Columbus, Ohio was Mr. Williams' birthplace on August 22, 1868. Following attendance at Columbus High School and Ohio State University, he engaged in the manufacture of stoves and heaters from 1893 to 1907. He then became secretary of the Midland Furnace Club, and was long active with the *National Warm Air Heating and Air Conditioning Association*, serving as secretary since its formation in 1914 and as managing director for 27 years before his retirement.

Mr. Williams is survived by his wife, Myrtle, a resident of Columbus, Ohio.

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*Member of Committee on Research.

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(59 Chapters; 1 Special Branch; 8 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

- **ARIZONA:** 1953. Hdqrs., Phoenix. Meets, 1st Mon. PRES., W. A. Biddle, 3817 N. 15th Ave. SECY., E. P. Maxwell, 39 W. Adams St.
- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, 3rd Tues. PRES., W. J. Franklin, 608 W. Third St. SECY., J. W. Thompson, 1314 Main St.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, 2nd Mon., PRES., J. M. Lazenby, 8 11th St., N.E. SECY., F. W. Bull, 1205 Spring St., N.W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, 3rd Wed. PRES., E. H. Taze, 33 E. 21st St. (18). SECY., R. F. Weisman, 4650 Reisterstown Rd. (15).
- **BLUEGRASS:** 1954. Hdqrs., Louisville, Ky. Meets, 2nd Mon. PRES., J. W. May, 215 Central Ave. SECY., A. E. Hausmann, 227 Lowell Ave., Charlestown, Ind.
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, 2nd Wed. PRES., S. C. Gale, 1628 W. 4th Ave. SECY., D. A. English, 1606 W. 1st Ave. (9)
- **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, 4th Wed. PRES., F. D. Putnam, 115 Pulsifer Dr., Auburn. SECY., Merle Weninger, 230 Goodrich Ave. (5).
- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, 3rd Mon. PRES., J. A. Guy, 478 W. Fifth Ave. (1). SECY., W. A. Schoonover, 2901 N. High St. (2).
- **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, 1st Tues. PRES., F. W. Wilson, 222-24 E. 14th St. SECY., R. G. Anderson, 1758 Elmore St. (23).
- **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, 3rd Thurs. PRES., C. L. L'Hommedieu, 76 Blatchley Ave. SECY., Walter Heywood, 14 Hartt Lane, Newington.
- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, 3rd Tues. PRES., C. V. Bankston, 2927 Jackson Ave. (25). SECY., W. B. Martin, Jr., 314 St. Charles Ave. (12).
- **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. Meets, 2nd Wed. PRES., E. C. Doyle, 315 Washington Ave. SECY., H. F. Kruger, 501 Seventh Ave., Troy.
- **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, 1st Thurs. PRES., Eric Roberts, 417 Market St. SECY., F. K. Crouch, 906 Cerrito St., Albany (6).
- **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, 2nd Mon. PRES., G. V. Zintel, 840 N. Michigan Ave. (11). SECY., H. G. Gragg, 228 N. LaSalle St. (1).
- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, 4th Tues. PRES., P. O. Patterson, 6300 N. Oakland Ave. (20). SECY., A. O. Roche, Jr., 3950 Broadway (5).
- **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, 1st Mon. PRES., H. A. Bickel, E. 7 Riverside Ave. SECY., Max Tonn, S. 4021 Latawah St.
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, 2nd Tues. PRES., W. E. Nanes, 220 Davidson Bldg. SECY., D. E. Schroeder, 2717 Cambridge.
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tues. after 1st Mon. PRES., Charles Yoe, P.O. Box 2239. SECY., T. L. Roberts, 2008 S. Parkwood Lane.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, 1st Mon. PRES., F. K. Ladewig, 3527 Broadway (11). SECY., R. M. Spencer, 1510 Main St. (8).
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, 4th Thurs. PRES., G. T. Christie, Midland & Notre Dame. SECY., A. J. McIntyre, 935 Garwood Ave.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, 3rd Tues. PRES., G. W. Sprague, 108 Cummington St. SECY., W. G. Burbo, 137 Newbury St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, 3rd Mon. PRES., A. W. Shelby, 972 Union Ave, SECY., A. T. Bevil, 1638 Union Ave. (4)
- **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, 1st Wed. PRES., R. W. Kimmel, 320 Loneworth St. (2). SECY., J. B. Rishel, 656 Selma Rd. (9).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, 1st Mon. after 10th of month. PRES., E. F. Glanz, 1761 W. Forest Ave. (8). SECY., J. H. Spitzley, 1200 Fort St., W. (26).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, 1st Mon. PRES., J. A. Craig, 814 S. Ninth St. (4). SECY., E. T. Erickson, 500 Baker Arcade (2).
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRES., J. E. Davis, Jr., P.O. Box 3216, West Jackson (7). SECY., L. H. Smith, 711 W. Capitol St.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, 3rd Mon. PRES., D. L. Lindsay, 4350 Sherbrooke St. (6). SECY., S. R. Plamondon, 2267 Melrose Ave. (14).
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, 2nd Tues. PRES., C. A. Goth, 3115 N. 49th Ave. SECY., L. J. Paulsen, 1901 S. 39th St.
- **NEW MEXICO:** 1954. Hdqrs., Albuquerque, N. M. PRES., J. H. Van Alsburg, 1330 Cerro Gordo, Santa Fe. SECY., J. K. James, 4462 Avenida del Sol.
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, 3rd Mon. PRES., R. L. Stinard, 51 E. 42nd St. (17). SECY., Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, 2nd Tues. PRES., H. M. Patrick, 20 Olcott Ave., Bernardsville. SECY., W. C. Kruse, Jr., 183 N. 13th St. (7).
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, 3rd Mon. PRES., M. W. Brown, 1213 Texas Bank Bldg. SECY., H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, 2nd Tues. PRES., J. T. McKinney, P.O. Box 5145 (16). SECY., G. A. McCune, 1908 Utica Square.
- **NORTHERN OHIO:** 1916. Hdqrs., Cleveland, Ohio. Meets, 2nd Mon. PRES., D. E. Mannen, 9104 Woodland Ave. (3). SECY., H. R. Canoyer, 1900 Superior Ave. (14).
- **NORTHERN PIEDMONT:** 1952. Hdqrs. Greensboro, N. C. Meets, 2nd or 3rd Fri. PRES., S. T. Oliver, 2307 Fairfield Ave. SECY., E. D. Frazier, 320 Ashland Dr.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, 2nd Mon. PRES., G. E. Ervin, 2800 N. Oklahoma St. (5). SECY., F. R. Denham, 320 Oklahoma Natural Bldg.
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, 1st Mon. PRES., M. C. Bailey, 1139 Bay St. SECY., H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thurs. after 1st Tues. PRES., E. E. Kelly, 4504 S.W. Corbett Ave. (1). SECY., K. N. Flocke, 3027 N.E. 31st Ave. (12).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, 3rd Tues. PRES., W. J. Robinson, 200½ Bank St. SECY., N. J. Howes, Box 264, R.R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, 2nd Tues. PRES., T. C. Caskey, 11642—26th Ave., S. (88). SECY., E. W. Triol, 407 Medical Arts Bldg. (1).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, 2nd Thurs. PRES., L. M. Church, 12 S. 12th St. (7). SECY., C. J. Forve, Parkwood Manor, Apt. B-202, State Rd. & Penarth Ave., Upper Darby.
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, 3rd Mon. PRES., E. C. Hach, 221 Broadmoor Ave. (34). SECY., E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, 1st Wed. PRES., V. F. Vallero, 620 12th St. SECY., Duane Pearsall, 1600 W. 13th Ave.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, 1st Wed. PRES., J. E. Marshall, 441 Pico Way. SECY., V. W. Thornburg, 2470 27th Ave.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, 2nd Tues. PRES., G. H. Bemarkt, St. Clair Dr., R.R. 1, Caseyville, Ill. SECY., W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, 3rd Thurs. PRES., J. S. Malahy, Jr., 1839 Line Ave. SECY., H. E. Scott, 2502 Woodford St.
- **SOUTH CAROLINA:** 1954. Hdqrs., Columbia, S. C. PRES., R. F. Donovan, P.O. Box 3053. SECY., J. E. McMurray, 1639 Blanding St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, 3rd Fri. PRES., J. W. Holland, 245 Esperson Bldg. (2). SECY., J. C. Lewis, Box 8188.
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, 1st Tues. PRES., C. D. Walz, 3600 San Pasqual St., Pasadena (10). SECY., H. F. Ulovec, 3886 Olympiad Dr. (43).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRES., R. S. Fullerton, P.O. Box 3697. SECY., J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, 3rd Tues. PRES., L. H. Hornor, Jr., 816 Insurance Bldg. SECY., Boone Crisp, P.O. Box 9065 (4).
- **TOLEDO:** 1954. Hdqrs., Toledo, Ohio. PRES., F. C. Richardson, Jr., 1938 Shenandoah Rd. (7) SECY., J. F. Guest, 1815 N. 13th St. (2).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, 3rd Thurs. PRES., A. A. Maycock, P.O. Box 36 (10). SECY., W. L. Stuewe, 1472 S. State St. (4).
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets, 3rd Wed. PRES., H. E. Marquart, 111 W. Main St. SECY., R. L. Burton, Jr., 1913 Lafayette Blvd.
- **WASHINGTON, D. C.:** 1935. Hdqrs., Washington, D. C. Meets, 2nd Wed. PRES., G. C. F. Asker, 1109 W. Broad St., Falls Church, Va. SECY., C. P. Humke, 5905 Berwyn Rd., Rt. 1, Box 89, College Park, Md.
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRES., L. C. McKay, 210 Sanford Bldg. SECY., J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets, 2nd Mon. PRES., F. W. Brundage, 512 N. Park St., Kalamazoo (11). SECY., F. L. Murray, 482 W. Michigan Ave., Battle Creek.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, 2nd Mon. PRES., Q. P. Thompson, 260 Richmond Ave. (22). SECY., G. E. Kuhn, 475 Woodland Dr., Kenmore (23).
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, 3rd Mon. PRES., L. C. Plaehn, 914 N. Broadway (2). SECY., H. W. Alyea, 507 E. Michigan St. (2).

SPECIAL BRANCH

- **SWITZERLAND:** 1952. Hdqrs., Zurich. PRES., H. C. Bechtler, Anemonenstrasse 40 (47). SECY., Walter Hausler, Erbstrasse 2, Kusnacht.

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- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRES., Alvah Ehrman, Box 4502, State College Station. SECY., R. W. McDonald, 1010½ Vance St.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRES., C. E. Durrett, 1215 College. SECY., R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, 1st Wed. after 1st Tues. PRES., R. E. Bulletset, 252 Kings Rd. SECY., I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind. CHAIRMAN, E. B. Katz, 415 State St. SECY., R. A. Chambers, 248 Littleton.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, 2nd and 4th Tues. PRES., D. F. Carroll, Box 6264. SECY., C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, 1st Tues. PRES., J. C. Rumpf, 16511 Muirland (21). SECY., L. J. Hayes, Jr., University of Detroit.
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, 1st and 3rd Tues.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont., Canada, CHAIRMAN, Alexander Tudor, 75 South Dr. SECY., T. M. Devine, More House, St. Michaels College.

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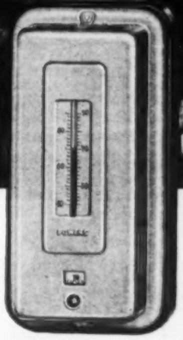

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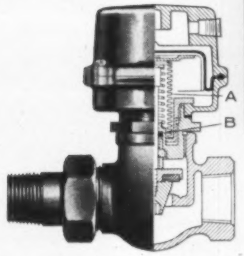

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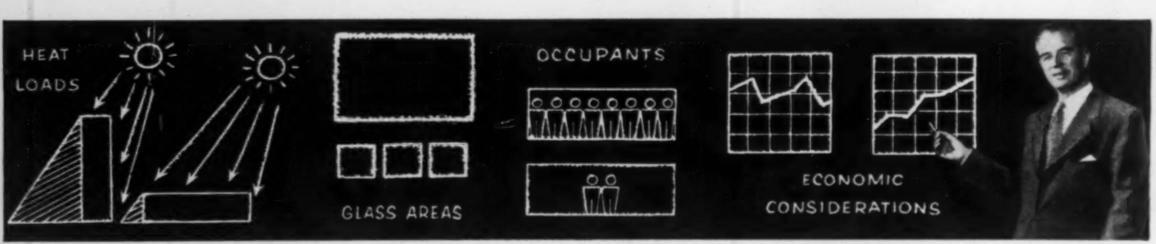

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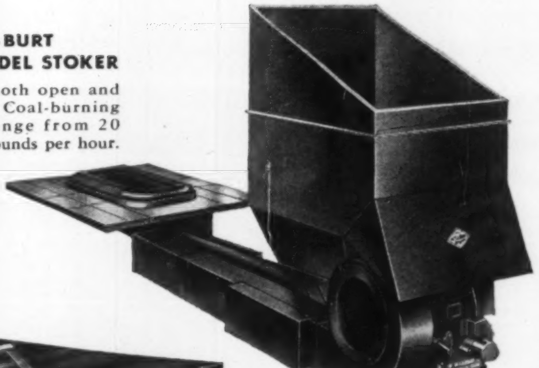
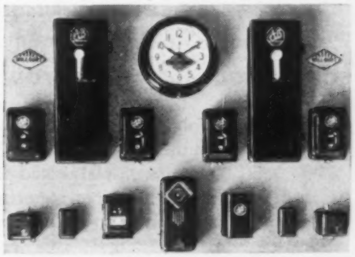
WILL-BURT HOPPER MODEL STOKER

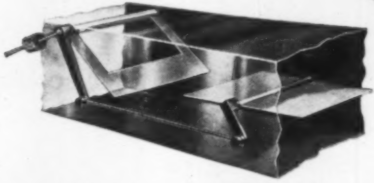
available in both open and closed hoppers. Coal-burning capacities range from 20 through 750 pounds per hour.





WILL-BURT CONTROL PANEL

Prewired, pretested control panel boards provide an interconnected control system for stokers to be operated by either a common operating and/or individual holdfire control, depending on the setting of the safety switch, off-on switch and timeswitch cycle. Mounting wall brackets are provided.



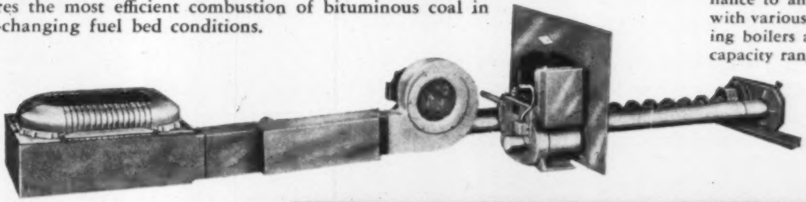
WILL-BURT AUTOMATIC AIR CONTROL

assures the proper combustion of fuel during the operating period as well as during the time the blower and feed screw are off. This patented device prevents a condition of smoke and soot. It allows for dissipation of any intense heat that may be surrounding the tuyeres or dead plate by permitting induction of normal draft to the fire bed. It automatically assures the most efficient combustion of bituminous coal in ever-changing fuel bed conditions.

ALL THESE ADVANTAGES WITH A WILL-BURT STOKER

WILL-BURT BIN FED STOKERS

reduce cost of coal handling and maintenance to an all-time low. For application with various types of bituminous coal burning boilers and furnaces, in the same fuel capacity range as hopper models.



Write on your letterhead for the Will-Burt Stoker Data Book, complete with engineering information, dimension and installation drawings, suggested specifications, etc. A valuable reference book, especially for architects and engineers.

The WILL-BURT Company

OVER TWENTY-FIVE YEARS IN THE STOKER BUSINESS

BOX 902 • ORRVILLE, OHIO

Halstead & Mitchell

for LONG LIFE PROTECTION

COOLING TOWERS

with the exclusive

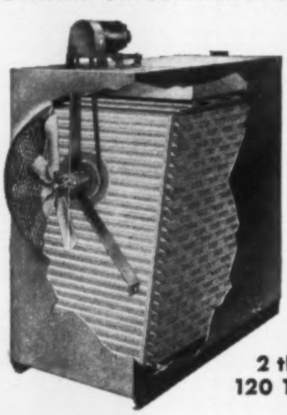
20-Year Guarantee!

on the wetted deck surface against rotting or fungus attack

YOU ARE GUARDED WHEN YOU CHOOSE A HALSTEAD & MITCHELL RESIDENTIAL OR COMMERCIAL TOWER

Only Halstead & Mitchell can offer a 20-Year Guarantee on the wetted deck surface against rotting or fungus attack because only Halstead & Mitchell creosotes cooling tower wood. No other material, subject to deteriorating or rusting, can be so guaranteed.

Stainless steel fans, sheet steel cabinets hydraulically painted with vinsynite, vinyl zinc and chlorinated rubber . . . add to this protection for the longest life. There's no extra cost for these extra protections . . . just extra long time benefits on the job.



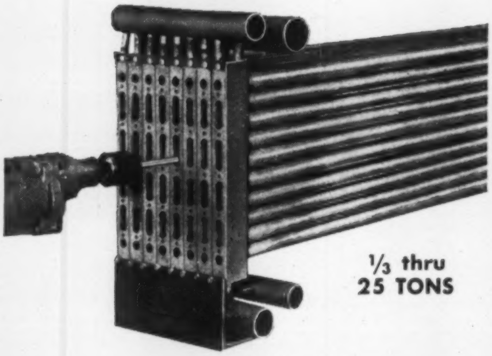
2 thru
120 TONS

CONDENSERS

with economical

Lifetime Cleanability

for always-new efficiency



1/3 thru
25 TONS

The cooling tower you select works with a condenser, and here again you are guarded by Halstead & Mitchell.

CLEANABILITY in a water-cooled condenser costs no more, but troubles from poor water conditions vanish. Heat transfer efficiency is maintained at new unit levels for life, for a simple mechanical cleaning tool restores heat transfer surfaces in minutes.

Regardless of whose condensing unit you buy, do what almost all leading manufacturers have done — specify CLEANABILITY. It's your most important protection . . . why settle for less?

AT LEADING HEATING AND REFRIGERATION WHOLESALERS EVERYWHERE

Write for Detailed Specifications

HM

Halstead & Mitchell

BESSEMER BUILDING • PITTSBURGH 22, PA.

On duct anchoring jobs...here's how you save with the

Overhead work is fast and easy with the Remington Stud Driver. It weighs only 6 lbs.—requires no outside power source.

REMINGTON STUD DRIVER

YOU SAVE TIME. With the Remington Stud Driver, you can set up to 5 fastening studs per minute in steel or concrete—each stud anchored solidly and permanently. This speed results from the tool's source of power, a 32 caliber cartridge. And its light weight (6 lbs.) and compact size make overhead duct work easier, less tiring.

YOU SAVE MONEY. Savings as high as 80% have been reported with the Stud Driver over old-style fastening methods. That's important with today's rising costs and means *you can bid lower, get more jobs!* And remember, the tool can be used on a wide variety of fastening jobs in addition to ducts . . . wood plates, pipe hangers, conduit and pipe clips and many others.

SEND COUPON BELOW. It will bring you our illustrated booklet on the Remington Stud Driver and show you how you can cut your fastening costs.

TYPICAL QUESTION FROM A CONTRACTOR

Q. *You said the tool pays for itself in a recent ad. About how many fastenings does it take to pay for it?*

A. *Purchase of a Remington Stud Driver, based on gross savings, can be justified with only a few hundred fastenings to concrete.*

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. HPAC-2
Remington Arms Company, Inc.
Bridgeport 2, Connecticut

Please send me my free copy of the new booklet showing how I can cut my fastening costs.

*Name*____________________

*Position*____________________

*Firm*____________________

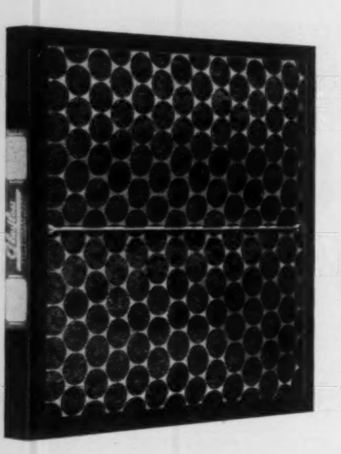
*Address*____________________

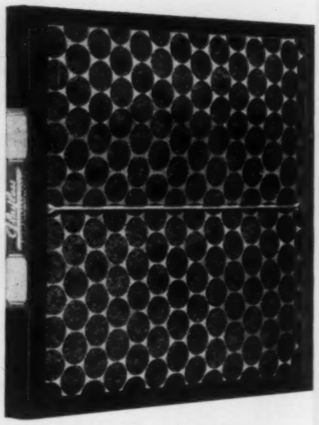
*City*____________ *State*__________

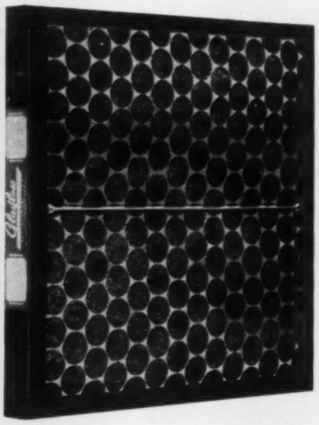
"If It's Remington—It's Right!"

Remington DU PONT

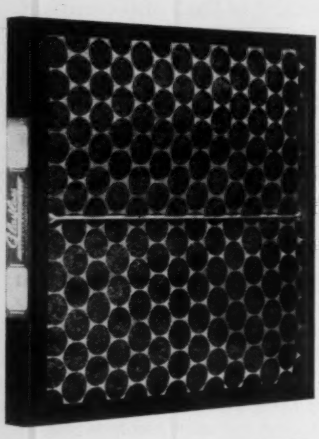
Listed & Approved by Underwriters' Laboratories, Inc.

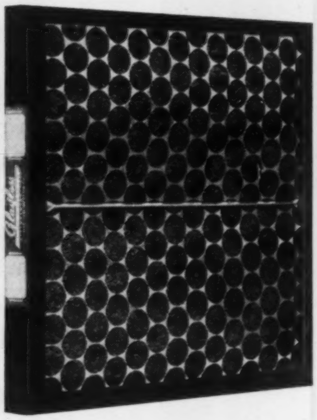


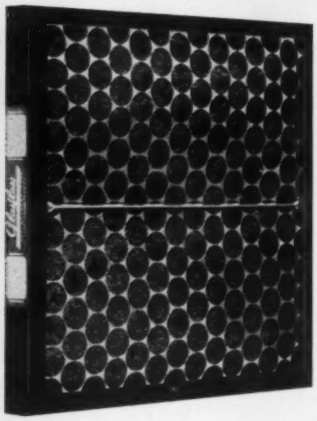




NEW AND IMPROVED AIR FILTERING...





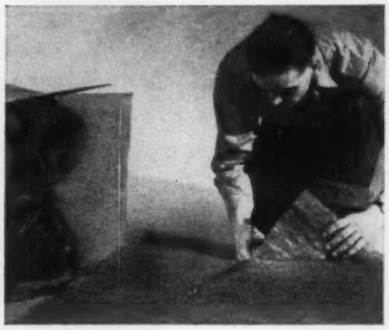


FIBER PPG GLASS **Glasfloss** **DISPOSABLE AIR FILTERS**

The new, extremely fine, silky fibers in Pittsburgh's improved Glasfloss Filters stop and hold more dust—and are easy on the hands!

Available in all standard furnace and air conditioning filter sizes, Glasfloss filter media is also available in Bulk Roll-Paks to provide convenient and economical replacement material for all commercial and industrial filtering uses.

For complete information and prices, write Glasfloss Dept., Fiber Glass Division, The Pittsburgh Plate Glass Company, One Gateway Center, Pittsburgh 22, Pennsylvania.

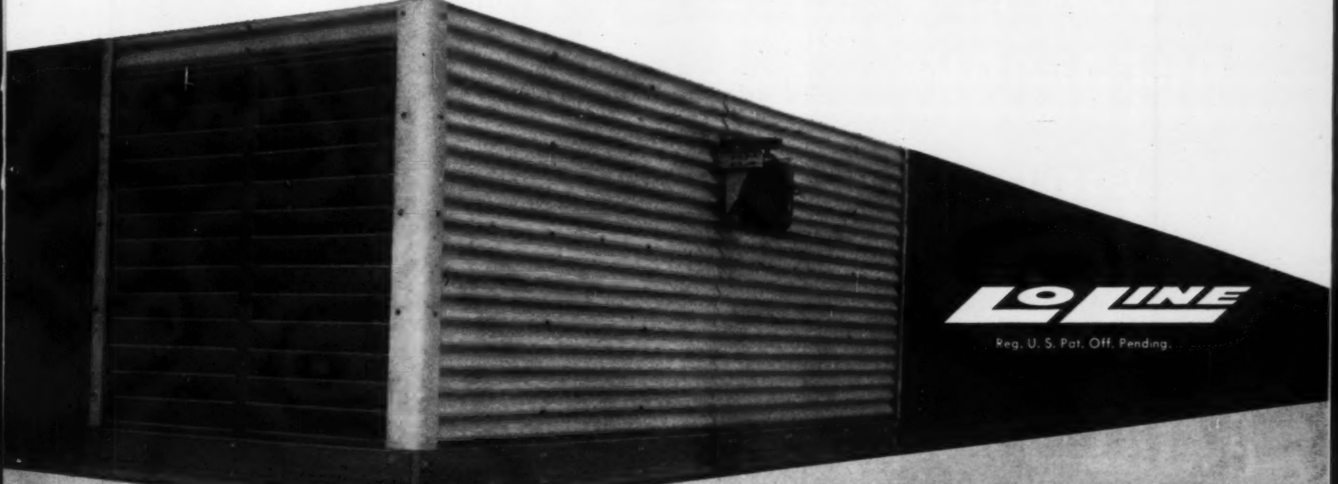


FIBER PPG GLASS

PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS

PITTSBURGH PLATE GLASS COMPANY

THE ALL-NEW PRITCHARD COOLING TOWER—
WITH THE LOW, LOW SILHOUETTE!



This new Pritchard LoLine Tower solves two problems for the architect, the building owner and the contractor.

First it meets the trend toward suburban building which has made longer, lower-lined buildings possible. Second, it answers the demands of metropolitan buildings where cooling towers must still be mounted on the roof, by providing a low silhouette which can be easily concealed.

Most important, Pritchard LoLine Towers combine proved new and old features into an efficient, economical cooling unit. This should be no surprise to the many thousands of satisfied Pritchard cooling tower users who have long known that Pritchard is "Industry's Partner for Progress!"

LoLine CONSTRUCTION FEATURES

FRAMEWORK. Select Heart redwood or better. Surfaced, machine fabricated for precision fit. Each member strongly braced with special connectors for economy and longer life.

AIR INLET LOUVERS. Two sets, one on each side of tower. Each set has slip-fit louvers of cement asbestos board, individually removable from machined slots for easy accessibility to tower.

CASING on the Pritchard LoLine Tower has been carefully designed to make the tower attractive from an architectural point of view. This has been done through the use of horizontally installed, corrugated, asbestos cement board panels and corner rolls which further add to the low appearance. Watertight construction is assured. The pre-fabricated panels are securely bolted to the framework.

MECHANICAL EQUIPMENT. Drive design is simple: V-belt or reduction gear drive supported by rigid hot-dipped galvanized structural members. Fan shaft is stainless steel with self-aligning bearings. Fan, equipped with aluminum blades, is carefully machined and balanced.

ACCESSORIES. A complete line of accessories including ladders, louver screens, fan discharge screens, and basin accessories are available. A new optional feature—internal water supply piping terminating in a flanged connection at the base of the tower—eliminates unsightly exterior water supply piping.

INDUSTRY'S PARTNER FOR PROGRESS

COOLING TOWERS
AIR COOLED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

REPRESENTATIVES IN PRINCIPAL CITIES FROM COAST TO COAST

J.F. Pritchard & Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 435, 4625 Roanoke Parkway, Kansas City 12, Mo.

This new LoLine brochure contains a complete description of construction details and mechanical equipment, complete with illustrations and cross-sectional drawing. Use the handy coupon below to send for your copy or copies!

IMPORTANT! Investigate the Pritchard LoLine Tower now! Send for new brochure containing detailed description!

J. F. Pritchard & Co. of California
Dept. 435, 4625 Roanoke Parkway,
Kansas City, Missouri

☐ Please rush me my complimentary copy of the new LoLine Cooling Tower bulletin.

☐ Please contact me immediately.

Name____________________

Firm____________________

Address____________________

City__________ Zone____ State________

DON'T OVERLOOK JOBS THE AXIAL FLOW DOES BEST!

The axial flow fan design offers distinct advantages well worth considering for a growing variety of jobs:

1. STRAIGHT LINE EFFICIENCY. Being basically designed for duct mounting, the axial flow is at its best when mounted in straight duct runs. "Buffalo" Axial Flows are giving excellent service as duct-mounted "boosters" in systems—also as light-duty ventilation, exhaust and industrial air conditioning supply fans.

2. LIGHT WEIGHT. This permits economical installation. In all but the very largest sizes, no heavy foundations or structural support are required. "Buffalo" Axial Flow Fans are often installed as part of the pipe or stack in hood and vat or other roof exhaust systems.

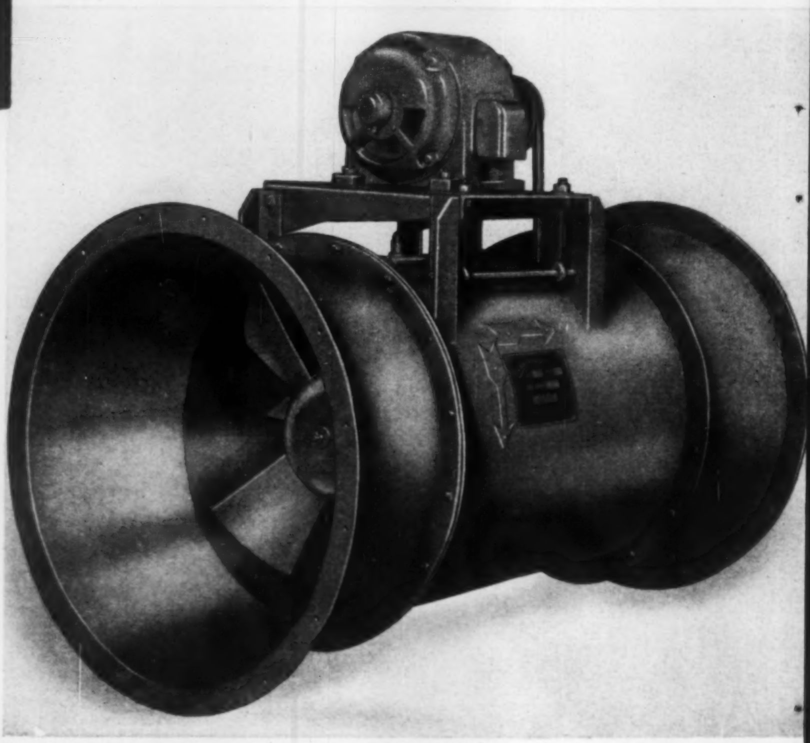
3. SPACE SAVINGS. These duct-size fans fit in close to walls or ceilings. Space-saving applications vary from paint spray booth exhaust to forced draft for cooling towers — from circulation of chilled air in quick freezing to boiler room cooling. Here, high efficiency influences the choice, as well as compact size.

Naturally, all axial flow fans are not alike. When you specify "Buffalo", you assure your customer the top performance inherent in the "Q" Factor*. Write today for Bulletin 3533-EF for full details.

Right, "Buffalo" Type "B" Vaneaxial Fan. Outlet guide vanes smooth out air flow for greatest efficiency and quiet operation. Available for high or low temperatures, corrosive fumes, explosive atmospheres, etc.

NOTE: No one fan is the answer to every problem. "Buffalo" builds all types, including broad lines of centrifugal and propeller fans. Full details on request.

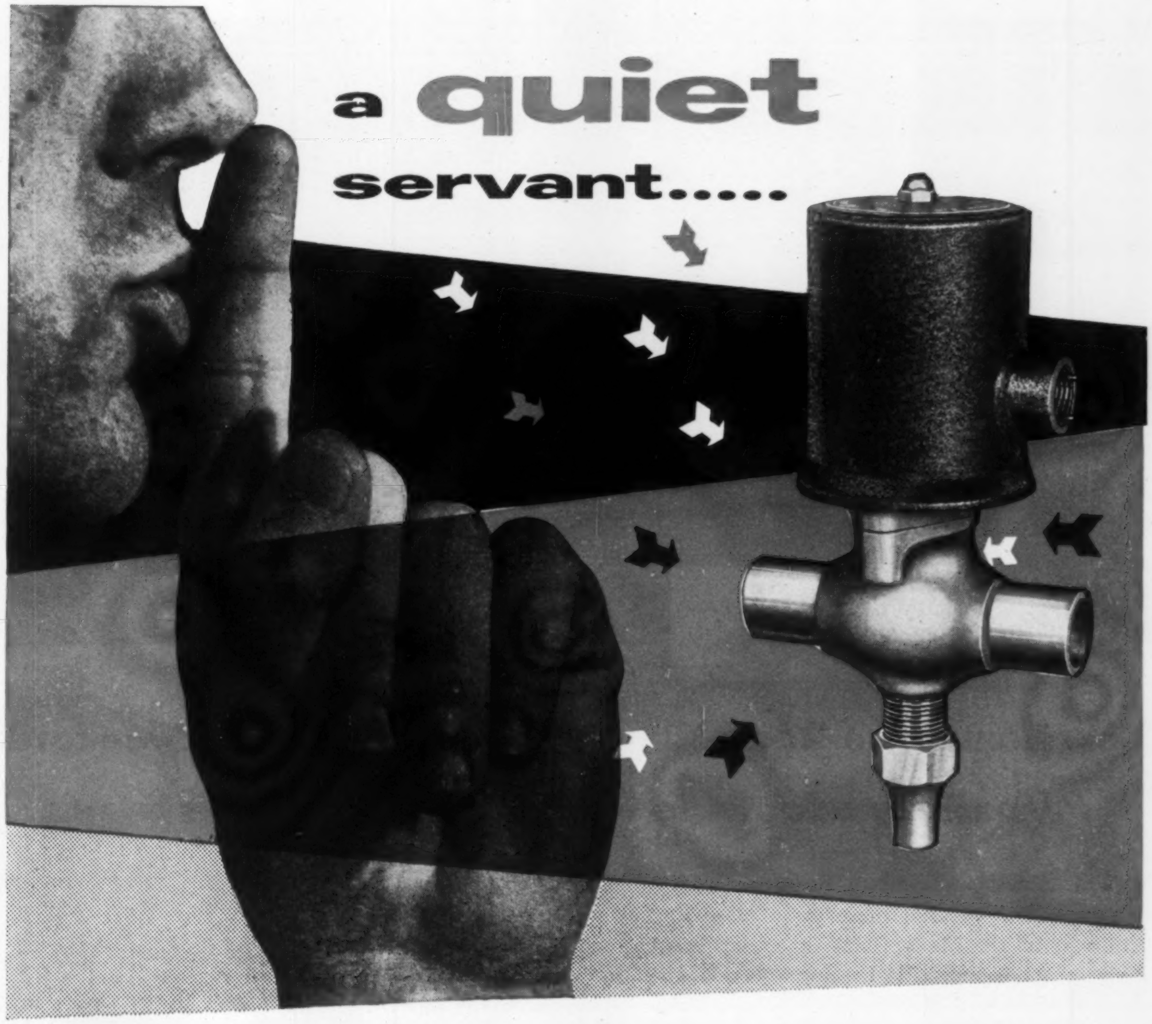
**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*



"Buffalo"

BUFFALO FORGE COMPANY
171 MORTIMER ST. BUFFALO, N. Y.
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives In All Principal Cities

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING



ALCO SOLENOID VALVES

...packless, tight-seating

Users like the positive, automatic shut-off of Alco Solenoids. They are precision controls manufactured for refrigerant flow. Coils are moisture-proof, extra powerful and wound for long life.

Alco Solenoids may be installed in remote locations and operated by any electrical control. For all types of refrigerant service—liquid, suction or hot gas discharge . . . and for brine, water, steam and air.

ENGINEERED
—for service
for life

Write for Condensed Catalog 20 and technical bulletins 173 and 182.

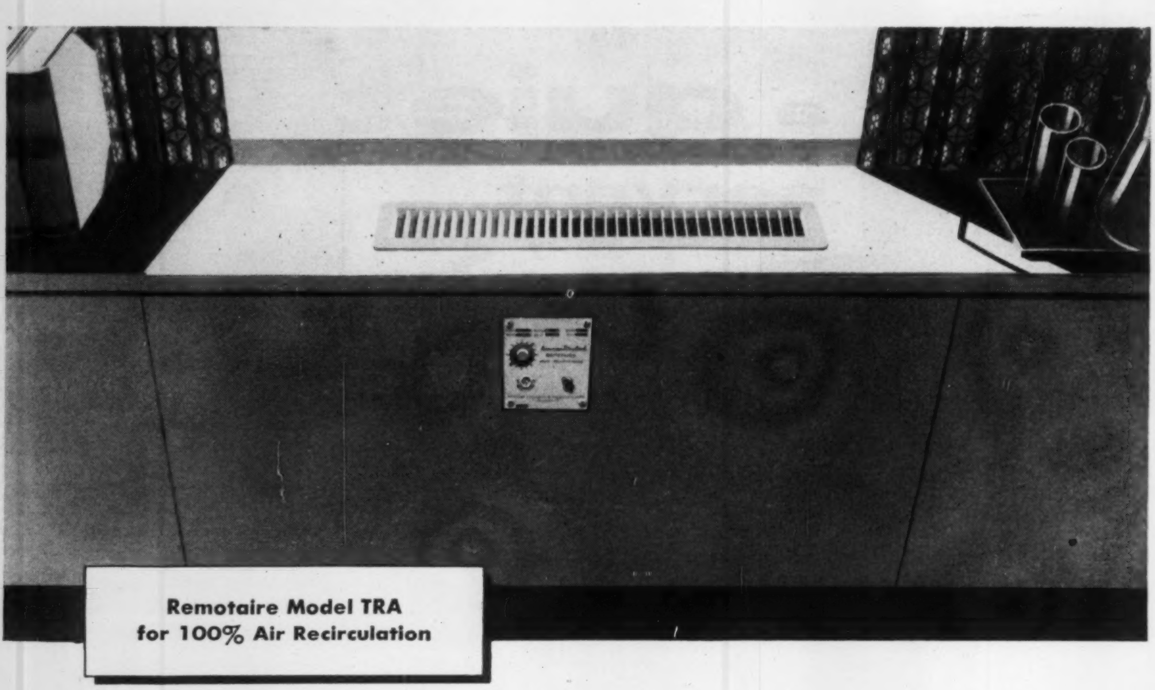
SEE YOUR ALCO WHOLESALER

ALCO

ALCO VALVE CO.
861 KINGSLAND AVE. • ST. LOUIS 5, MO.

Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

6315



**Remotaire Model TRA
for 100% Air Recirculation**

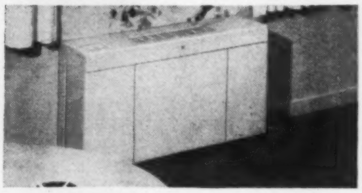
New Remotaire Room Conditioner by American-Standard

. . . specially adaptable to interior ventilation systems

● Now American-Standard Remotaire is more versatile than ever. A new unit—the Model TRA—is designed for cooling and heating the peripheral zone of office buildings, hotels, and other buildings which use interior ventilation systems. Fresh outside air is supplied by small ducts connected to the air conditioning system of the interior zone. These ducts usually are located in furred down ceilings and are connected to small side wall outlets or ceiling diffusers. The interior zone system is designed to provide a mixture of conditioned outside air and recirculated air, or for 100% outside air during intermediate seasons.

Designed for total recessing, the new Model TRA uses a simple piping system that carries hot water for winter heating and chilled water for summer cooling from a central plant. Room air is conditioned all year long!

Available in 200, 300, 400 and 600 cfm sizes, the Model TRA unit has three-speed fan control which provides a wide range of air quantities and heating and cooling capacities. A size for every job!



Look what Remotaire offers:

Every Remotaire unit is listed by Underwriters' Laboratory, Inc., Reexamination Service.

One simple piping system for both summer cooling and winter heating.

Individual room temperature control without affecting adjoining space.

Large filters which keep air fresh and clean.

Drain pan runs the entire length of unit to collect condensation drip.

Coil shield prevents foreign matter from falling into coil.

American-Standard Water Chillers for use with Remotaire Systems are available in sizes from 2 to 75 hp. And for the heating cycle, American-Standard has a complete line of boilers for all heating requirements. One dependable source for a *complete* heating-cooling system.

AMERICAN-Standard
WATER HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Now! Tough, hard-to-reach drilling jobs, made easy with the

new SKIL ¼" DRILL

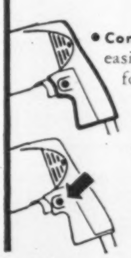
MODEL
75
55% more powerful...
yet lighter in weight

SPEED DRILLING WORK ON THE JOB OR IN THE SHOP!

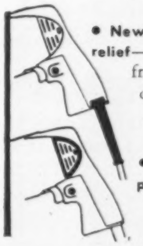
Already this newcomer to the heavy duty drill field has become one of the most popular tools in the SKIL line.

Although it's lighter in weight and much easier for the workman to handle, it's actually 55% more powerful. That makes this compact powerful tool ideal for drilling tough, hard-to-reach jobs in a hurry. The Model 75 reduces time and labor costs . . . increases worker output and speeds assembly operations. Matchless performance, longer life, top operating power.

Look over these important features:



- **All anti-friction bearings**—for greater efficiency and low maintenance.
- **Contour-fit handle** for easier and more comfortable handling.
- **Handy, safety-designed trigger** located on side gives continuous easy operation.



- **Motor 55% more powerful,** yet *lighter* than previous model.
- **New molded rubber strain relief**—protects cord against fraying or breakage at drill cord attachment joint.
- **Larger inspection plates,** easily removed for checking and cleaning.

FREE!

Demonstration and Free Trial will Prove "SKIL is the Answer" to Your Installation Bottlenecks! Send Coupon Today!

SKIL
PORTABLE TOOLS

Made only by SKIL Corporation
formerly SKILSAW, Inc.
5033 Elston Avenue, Chicago 30, Illinois
3601 Dundas Street West, Toronto 9, Ontario
Factory Branches in All Leading Cities

MAIL THIS COUPON!

SKIL Corporation, Dept. HPA-25
5033 Elston Avenue, Chicago 30, Illinois

☐ I would like a demonstration and trial . . . Free!
☐ Please send me illustrated literature on the new SKIL Model 75 ¼" Drill.

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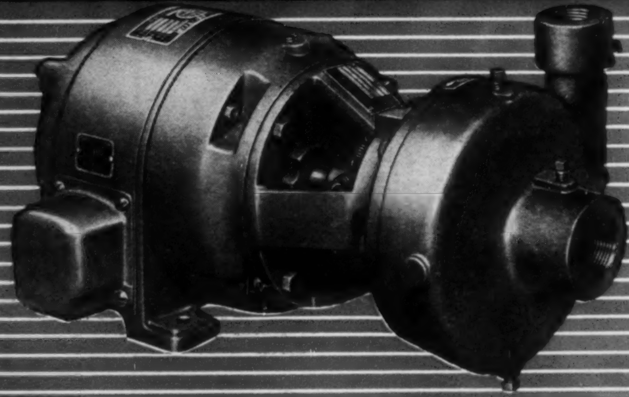
Company__________
Street__________
City__________ Zone_____ State__________

STOP PUMP NOISE!

IN COOLING TOWER AND OTHER REFRIGERATION APPLICATIONS



SERIES **1522**
CENTRIFUGAL PUMPS
ARE **QUIETER**
THAN OTHER PUMPS USED
FOR THE SAME PURPOSE

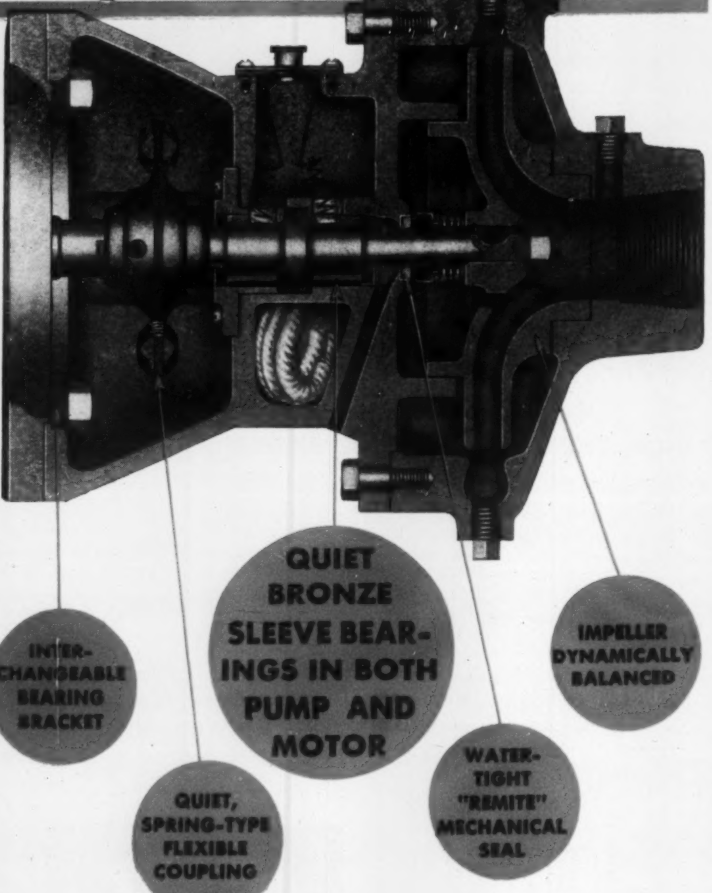
Where else CAN YOU FIND SO MANY EFFICIENCY FEATURES IN ONE PUMP

If you're having noise trouble (or any other kind) in your refrigeration and air conditioning installations, better switch now to the B & G Series 1522 Pump.

This pump is *really quiet*... because *both pump and motor* are equipped with long bronze sleeve bearings... and because of the noise-dampening flexible spring coupler.

The 1522 is alive with other features for dependable performance. Leakage is eliminated by the "Remite" Mechanical Seal, self-lubricating and harder than glass! The impeller is dynamically balanced—the bearing bracket subassembly, including shaft and sleeve bearing, is interchangeable. Easily serviced—the pump separates into three parts.

The B & G 1522 is available in all-iron, bronze-fitted, all-bronze or stainless steel units, capacities to 150 GPM —heads to 115 feet.

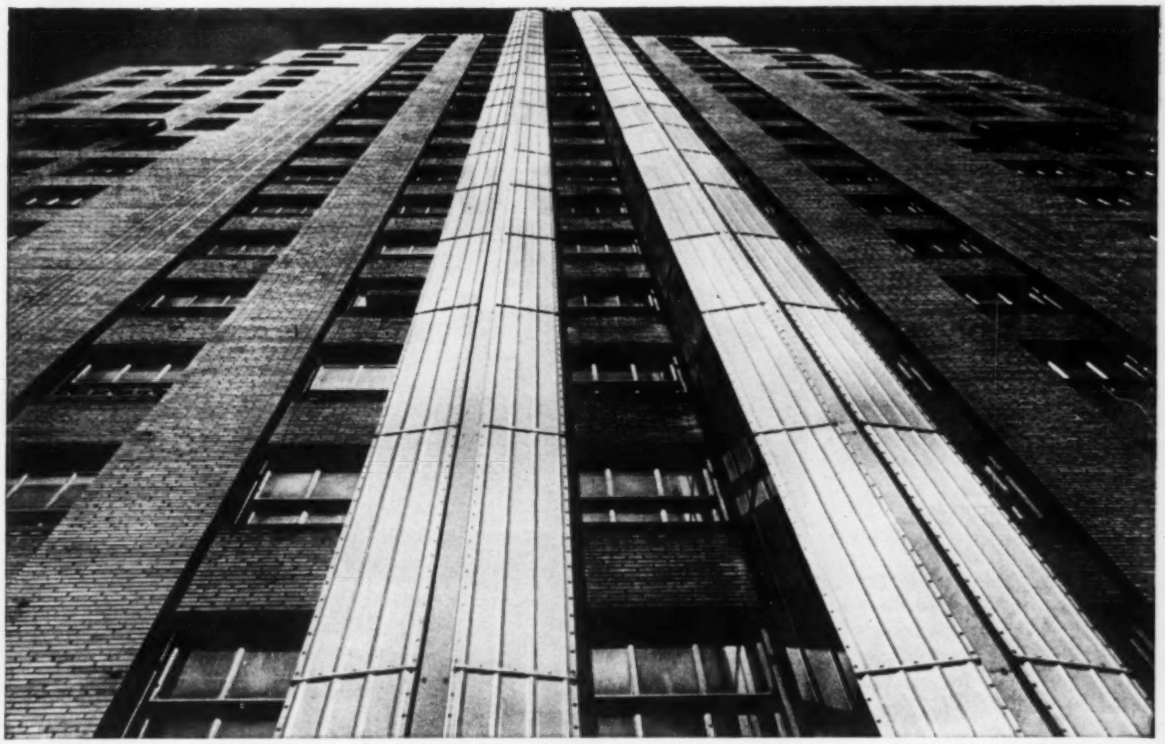

INTER-CHANGEABLE BEARING BRACKET
QUIET, SPRING-TYPE FLEXIBLE COUPLING
QUIET BRONZE SLEEVE BEARINGS IN BOTH PUMP AND MOTOR
WATER-TIGHT "REMITE" MECHANICAL SEAL
IMPELLER DYNAMICALLY BALANCED

For complete data send for Bulletin FK-653

BELL & GOSSETT COMPANY

Dept. RDT-5, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada



MODERN COMFORT in modernized skyscrapers

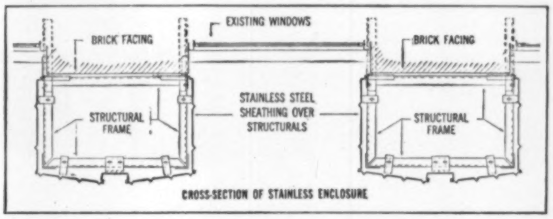
Modernized office buildings successfully compete with the newest skyscrapers when they are equipped with the latest air conditioning systems. That's what owners of one New York building concluded in 1950. The result is this strikingly modern facade on the 25-story Herald Square Building.

Chilled water risers **on the exterior of the building** are protected and concealed by a jacket made of durable 18-8 stainless steel.

Branch lines carry the chilled water from the risers into corridors on each floor. Piping is hidden between the original 10-foot high ceiling and the new furred, 8-foot ceiling. Conduits from the branch lines lead to individual air-conditioning units.

No Loss of Space

This technique eliminates the cost of cutting through 25 floors to extend the chilled water risers. **And there is no loss of rentable floor space.**



CROSS-SECTION OF STAINLESS ENCLOSURE

Many architects also use Armco Stainless Steel to conceal interior ventilating ducts through decorative treatment. They prefer this modern metal for both exterior and interior work because it harmonizes with any building plan or color scheme. Equally important, it stays attractive, holds up under tough usage and corrosive atmospheres, and is easy to keep clean.

We'll be glad to send you our new folder telling "Why, How and Where Architects Specify Stainless Steel." Just fill in and mail the coupon for your free copy.

ARMCO STEEL CORPORATION

905 Curtis Street, Middletown, Ohio

Send me a copy of your free folder on "Why, How and Where Architects Specify Stainless Steel."

Name____________________

Position____________________

Company____________________

Street____________________

City__________ Zone_____ State________

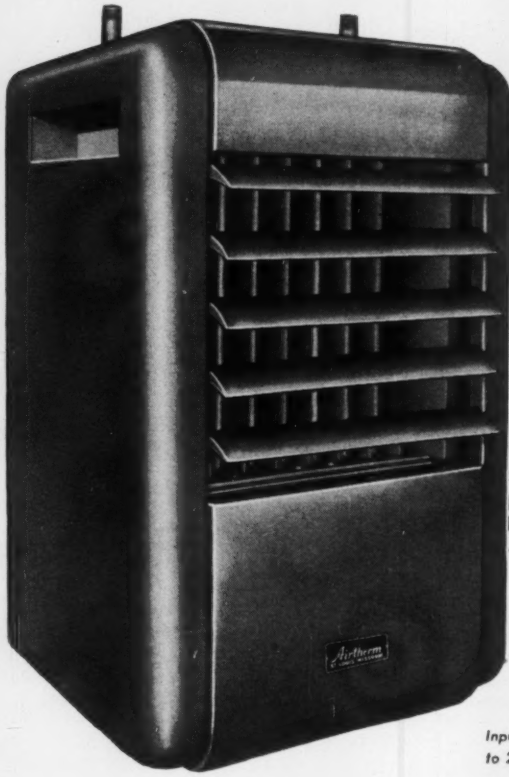
ARMCO STEEL CORPORATION

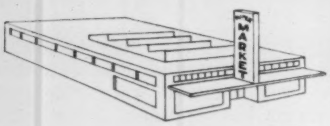
SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

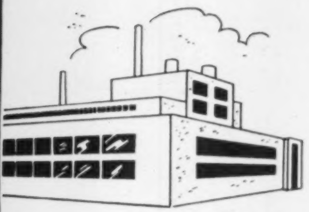
Put Heat Where You Need It . . .

Easily and Economically

with *Airtherm* GAS UNIT HEATERS







Input 25,000 BTU
to 200,000 BTU

These attractive, self-contained units now give you new freedom and flexibility in laying out heating systems. For quiet, clean and completely automatic heat, they can be installed just about anywhere you can run a gas pipe.

In addition to general heating in commercial, industrial and institutional buildings of all kinds, you'll find Airtherm Gas Unit Heaters useful for many special purposes, such as drying, blanketing doorways, etc.

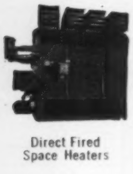
For complete data on gas unit heater installation with all types of gases, write for your FREE copy of Catalog 500.

Convectors

Vertical
Steam Unit
Heaters

Horizontal
Steam Unit
Heaters

Centrifugal
Fan Type
Unit Heaters



Direct Fired
Space Heaters

Gas Fired
Unit Heaters

FOR HEATING SATISFACTION . . . THINK FIRST OF

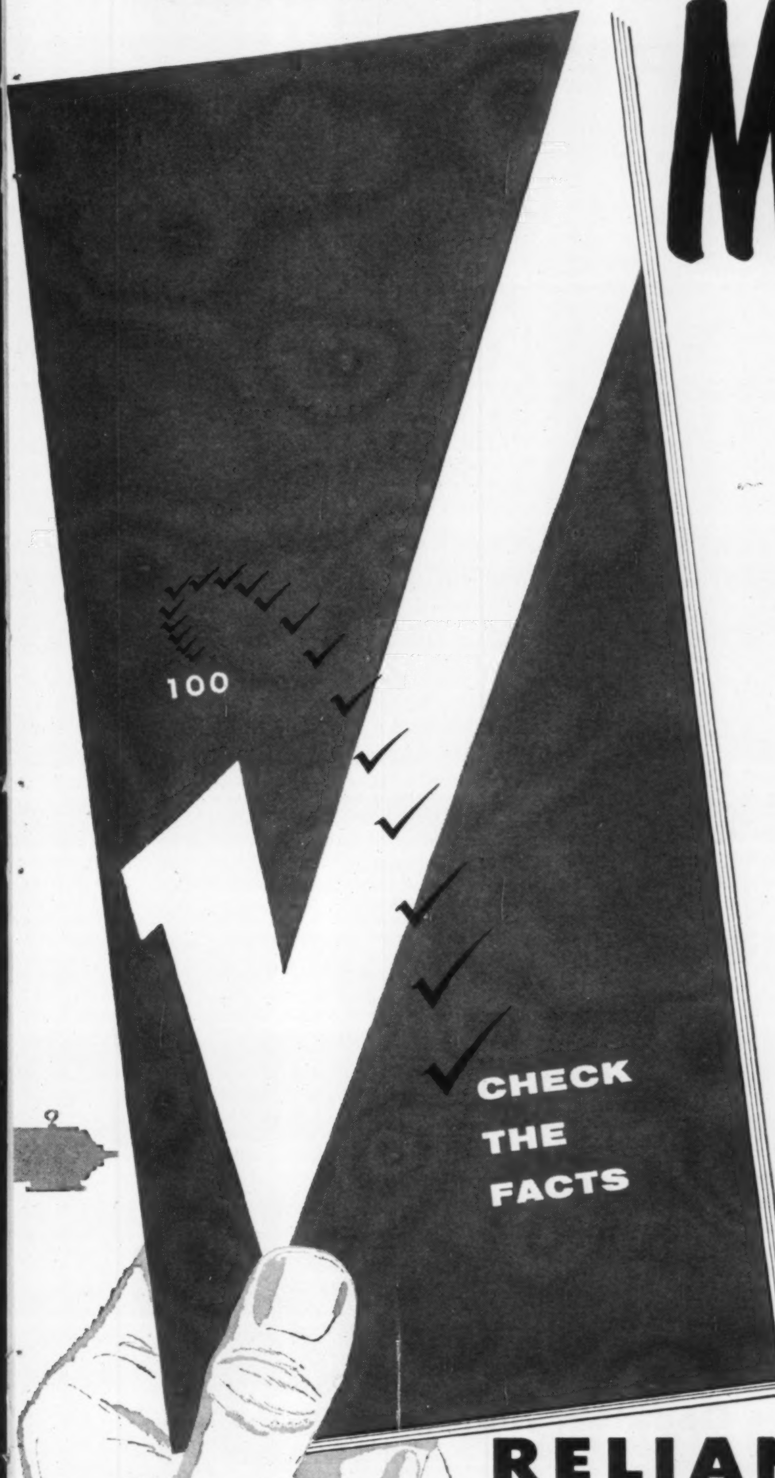
Airtherm

MANUFACTURING COMPANY
711 South Spring Avenue • St. Louis 10, Missouri

NEW

TOTALLY PROTECTED A-C.

MOTORS



Yes, it's true!

Industry everywhere is checking into the facts about these amazing new *Totally* Protected A-c. Motors by Reliance.

To help *you* check the facts to see where it fits into *your* production area, we've prepared a booklet called "Check the Facts".

Get your copy today—by mail, or through your local Reliance district sales office or distributor.

B-1489

RELIANCE ELECTRIC AND ENGINEERING CO.

Canadian Division: Welland, Ontario

1052 IVANHOE ROAD • CLEVELAND 10, OHIO

RELIANCE Precision-Built MOTORS

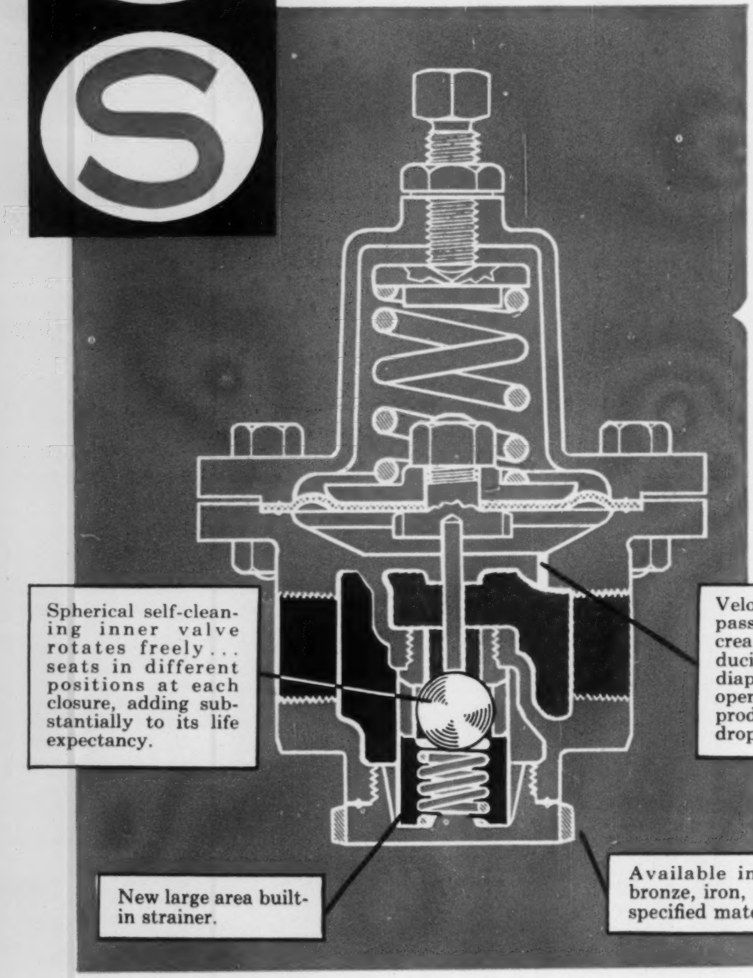
Builders of the Tools of Automation

RELIANCE V★S DRIVE

THE LATEST CASH STANDARD VALVE

TYPE 1260

Direct Operated • Self Contained • Single Seat
Pressure Reducing and Regulating



Spherical self-cleaning inner valve rotates freely . . . seats in different positions at each closure, adding substantially to its life expectancy.

Velocity of gas or liquid passing the body port creates suction, thus reducing pressure in lower diaphragm chamber and opening valve wider to produce lower pressure drop.

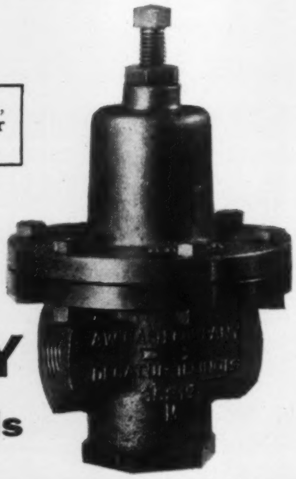
New large area built-in strainer.

Available in aluminum, bronze, iron, steel or other specified materials.

WITH EXCLUSIVE DESIGN* for . . .

- Extremely LOW PRESSURE DROP and LOCKUP
- MINIMUM SIZE and WEIGHT with MAXIMUM SENSITIVITY
- LOWER INITIAL COST
- LONGER LIFE
- EASY SERVICING without removing from pipeline
- UNIVERSAL APPLICATION: water, gas, steam, air, oil & other non-corrosive fluids
- 300 psi INLET PRESSURE . . . 3 to 250 psi DELIVERED PRESSURE

**patent applied for*



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A. W. CASH COMPANY

P. O. Box 551 • Decatur, Illinois

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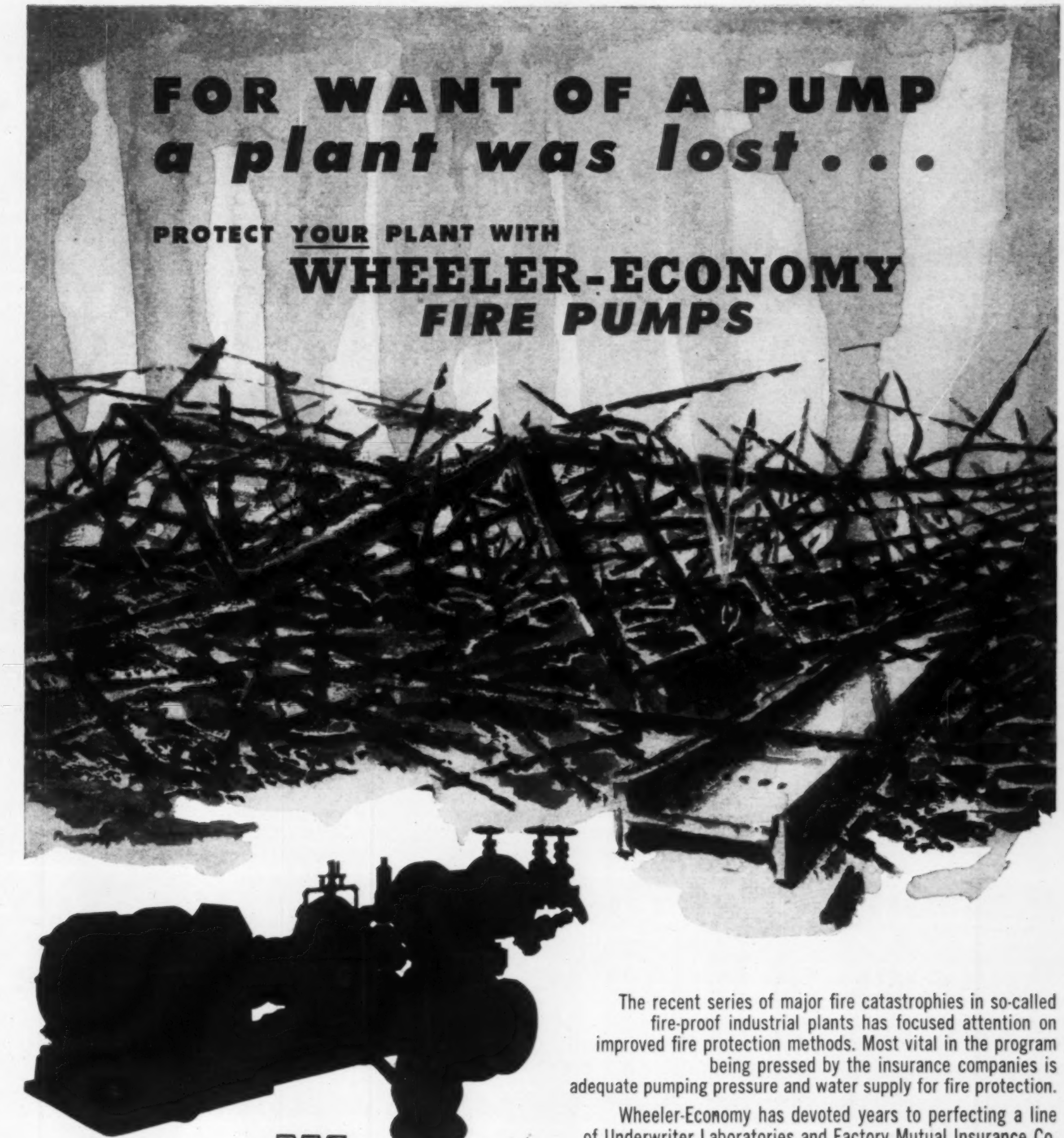

The recent series of major fire catastrophies in so-called fire-proof industrial plants has focused attention on improved fire protection methods. Most vital in the program being pressed by the insurance companies is adequate pumping pressure and water supply for fire protection.

Wheeler-Economy has devoted years to perfecting a line of Underwriter Laboratories and Factory Mutual Insurance Co. approved fire pumps.

Look into this line today . . . A Wheeler-Economy Fire Pump may save you untold losses in equipment, production and employment by being on the job with "pressure-plus" when fire breaks out.

Write for Bulletin and name of nearest Wheeler-Economy representative.

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WE-402

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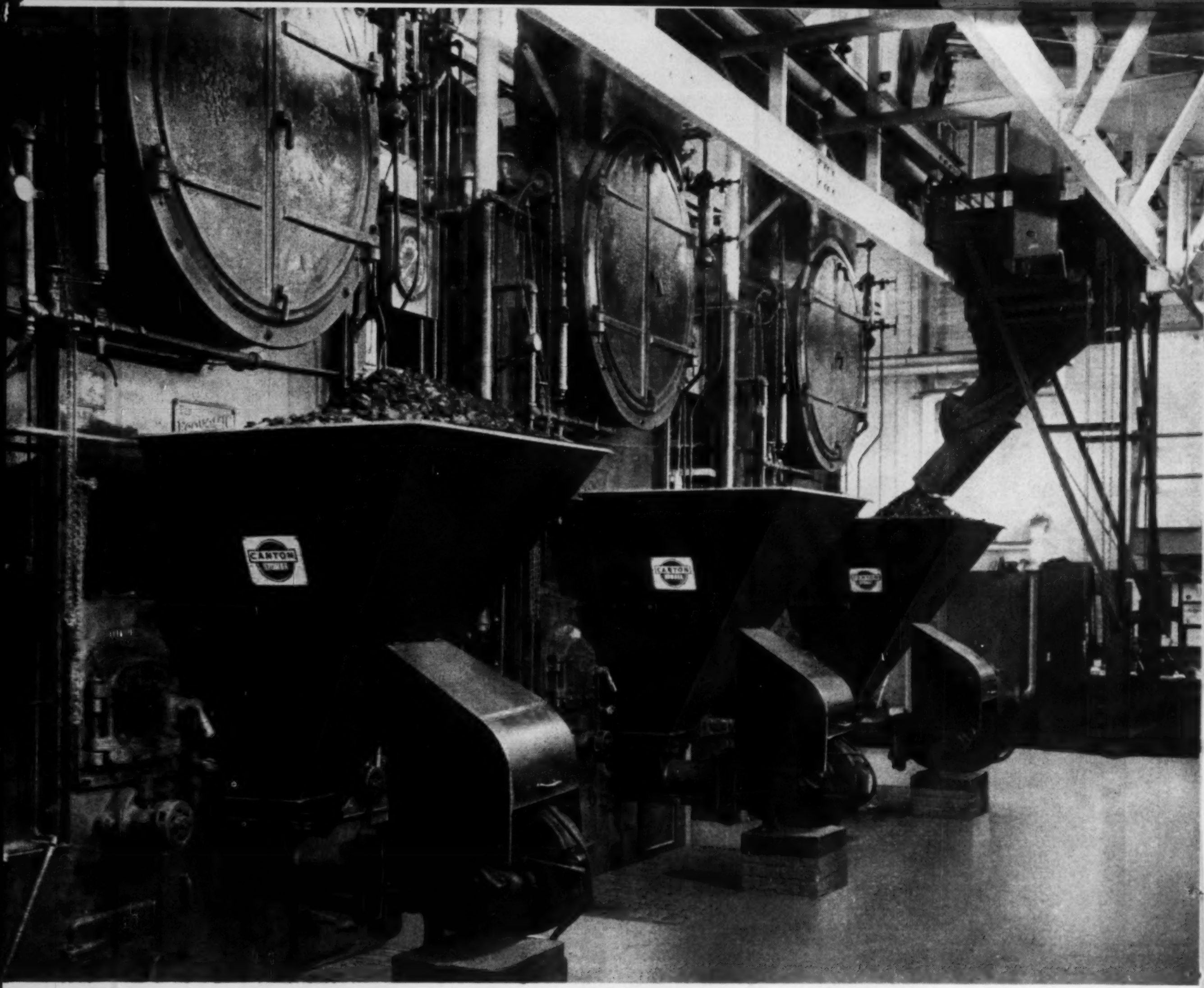
ECONOMY PUMPS, INC. · DIVISION OF C. H. WHEELER MANUFACTURING CO.
19TH AND LEHIGH, PHILADELPHIA 32, PA.



Burning coal the modern way saves Lakewood Hospital 22% in fuel costs

When Lakewood Hospital, Lakewood, Ohio, recently enlarged its facilities, the hospital authorities decided to install a new boiler plant. After careful consideration, they chose coal.

Today the hospital's automatic coal-burning equipment supplies steam at high efficiency to laundry, kitchen, sterilizers and heating system. The coal is handled and burned cleanly, meeting rigid sanitary requirements. And, based on local rates, coal costs $4,068 less per year than natural gas and $6,348 less than oil! Using the lower figure, burning coal the modern way has effected a 22% savings in fuel costs.

Investigate Your Fuel Costs

If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars every year.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available.

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

Automatic coal and ash handling systems can cut your labor cost to a minimum.

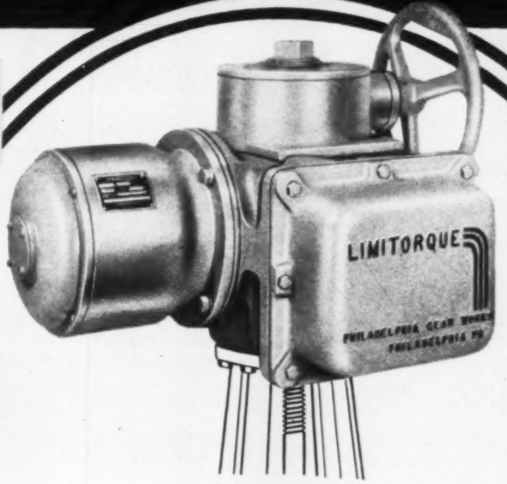
Coal is the safest fuel to store and use. No dust or smoke problems when coal is burned with modern equipment.

Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D.C.

new Limitorque® economy...



greater valve stem capacity

gives more torque

withstands greater thrust

compact and simple

features

Two piece stem nut design permits changing unit from one valve to another. Torque control for both directions of stem travel or single direction as required. Easier handwheel operation. Improved switch design and electrical arrangement. Either torque or geared limit control operation. Easier declutching.

no complicated gear drives

minimum friction losses

most economical and dependable operator for all small valves.

Do you have need for a small, low cost automatic valve operator that will give you rapid operation control of your valves? If so, the SMA-00 and SMA-000 is the answer. They are readily adaptable to all types of valves, including gate, plug, globe and butterfly.

Size for size these units are designed for greater valve stem capacity, will produce more stem torque, and will withstand greater thrust than any other valve operator on the market. Also, should a power failure occur, LimiTorque can be operated by the hand wheel.

It will pay you to secure full details regarding this exclusive, accurate and powerful small valve operator. We suggest that you send for new LimiTorque Bulletin 1A-54 which illustrates and describes the construction and operation of these little giants.

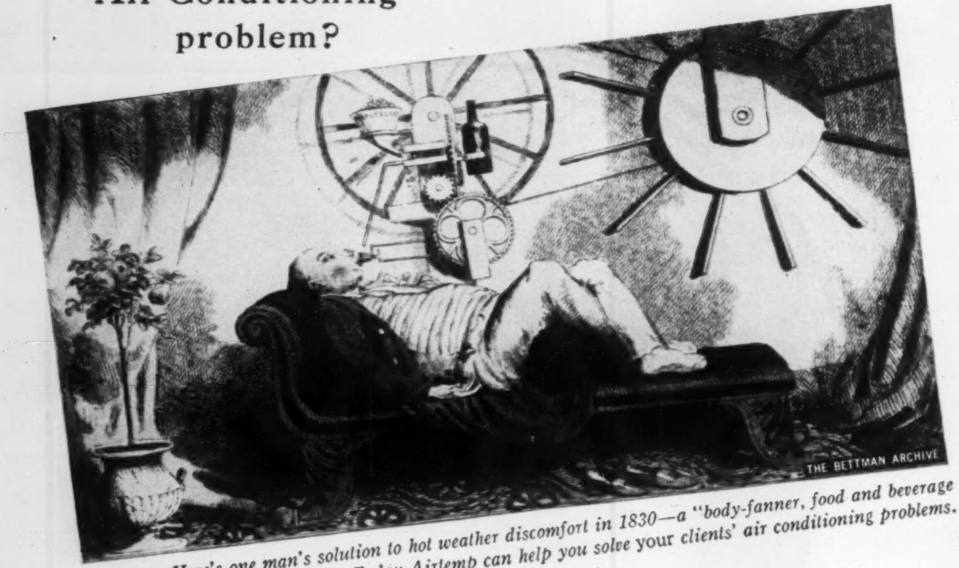
LIMITORQUE

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. & G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
LimiTorque Corporation Philadelphia

Industrial Gears & Speed Reducers
LimiTorque Valve Controls
Established 1892

Do *you* have an Air Conditioning problem?



Here's one man's solution to hot weather discomfort in 1830—a "body-fanner, food and beverage helper." Today Airtemp can help you solve your clients' air conditioning problems.

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Here's how Airtemp can help you in planning commercial and industrial air conditioning.

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Airtemp manufactures precision-built equipment for *every* type of modern air conditioning system—conventional or specially engineered, for a room or a building.

Advice of Experienced Engineers
Through Airtemp Construction Corporation, a subsidiary of Chrysler Corporation, we offer architects, engineers and contractors, the services of engineering specialists—pioneers in commercial and industrial air conditioning.

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The name Chrysler is synonymous with quality and engineering leadership.

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Airtemp's network of service personnel and facilities is your guarantee of dependable local service.

Peak Efficiency at Low Cost
Airtemp systems are famous for their efficiency. This means low installation cost, as well as low operating costs.

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Dept. HPAC-2-5, Dayton 1, Ohio.

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AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, INDUSTRY

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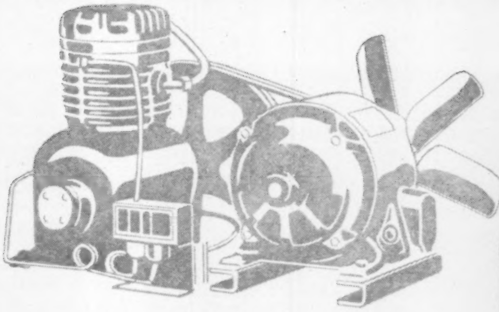
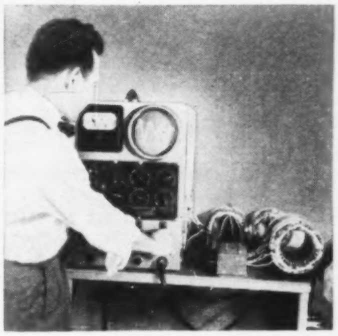


The motor is no problem when you use A. O. Smith hermetics in your air conditioning compressors

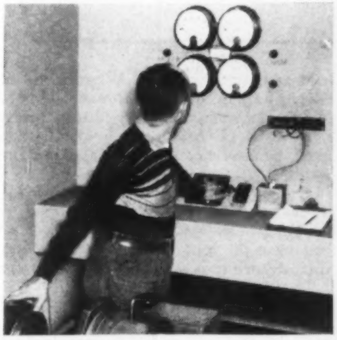
CUSTOM-ENGINEERED to operate inside hermetically sealed compressors . . . carefully built under controlled conditions — these A. O. Smith motors are ready to prove their dependability in your equipment.

Picture a motor manufacturing setup as clean as a food processing plant — with humidity and temperature precisely controlled the year around. *That's the picture in A. O. Smith's hermetics department. No dust or dirt to stop these motors when they work for you.*

Imagine production-line quality control in which every motor must pass the toughest electrical and mechanical tests. *That's the procedure for A. O. Smith's hermetics. Your protection against failure in service.*



Surge comparison testing machine spots shorts in the coils . . . is used to test every hermetic motor.



Torque and speed for every hermetic motor are tested under load on a dynamometer.

Through research . . . *a better way*

A.O.Smith
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ELECTRIC MOTOR DIVISION
P. O. Box 170 • Dayton, Ohio
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GET ALL THE FACTS about A. O. Smith hermetic motors — 1½ through 10 hp. Write A. O. Smith Corporation, Electric Motor Division, P. O. Box 170, Dayton, Ohio.

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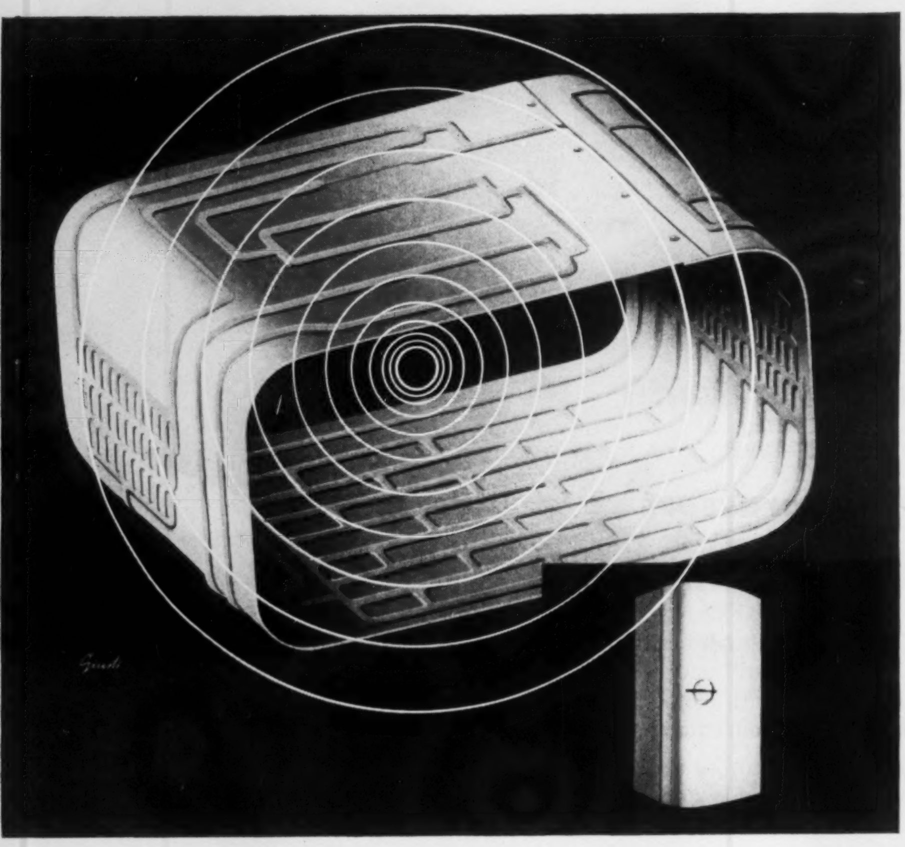
EVAPORATORS...

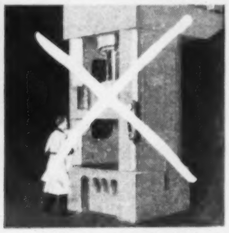
proved in over 300,000 homes!



Complete Flexibility. Any pattern of tubing—any manufacturing design that can be drawn on paper — can now be produced simply and easily *inside* perfectly bonded metal sheets. Dimensions of tubing can be fixed as desired.

2000
3000
4000
1000

Automatically Leakproof. Pattern channels must be leakproof or the Roll-Bond sheet cannot be made. Production mechanics prevent a leaking sheet from reaching completion. Western Roll-Bond *guarantees* no leaks!



Die and Press Costs Eliminated. A complete redesign of any tubing pattern costs less than $50, not $50,000 – is completed in days, not months. Traditional ideas of manufacturing costs are shattered completely.

with Western Roll-Bond... any product using
the heat exchanger principle can be made faster,
more efficiently and at a substantial saving

Now—right now—refrigerators containing evaporators made of Western Roll-Bond aluminum are bringing more efficient refrigeration to thousands of homes across the country—and have captured the imagination of refrigeration design men everywhere. Even as you read this, one of the major manufacturers of refrigeration equipment is designing his entire 1956 line around the advantages offered by roll-bonded metal—many others are proving to themselves by exhaustive tests that Roll-Bond evaporators excel any other evaporator on the market.

Take your own first step into a whole new era of refrigeration—start thinking and planning in terms of better, less expensive heat exchangers made of Western roll-bonded sheets. Press and die costs are eliminated *automatically*. Leaks are impossible. You can forget voids and frost blisters forever. Your engineers can now count on heat transfer characteristics equal to the metal itself because heat never has to go through low conductivity welds.

Call or write Western Metals. Ask for the complete technical information on Western Roll-Bond metals in the brochure, "A Pattern for Your Future." Or send us the plans or problems you have on your new products. Western Roll-Bond can help you advance into a new technological age—*in weeks!*

Free! Actual Sample of
Western Roll-Bond Process Metal
Management, Engineering and
Production men frequently ask for an actual
piece of Western Roll-Bond Process Metal.
Western Metals will be happy
to supply samples on request.
Write to Roll-Bond Process, Western Brass,
Dept. G. East Alton, Ill.

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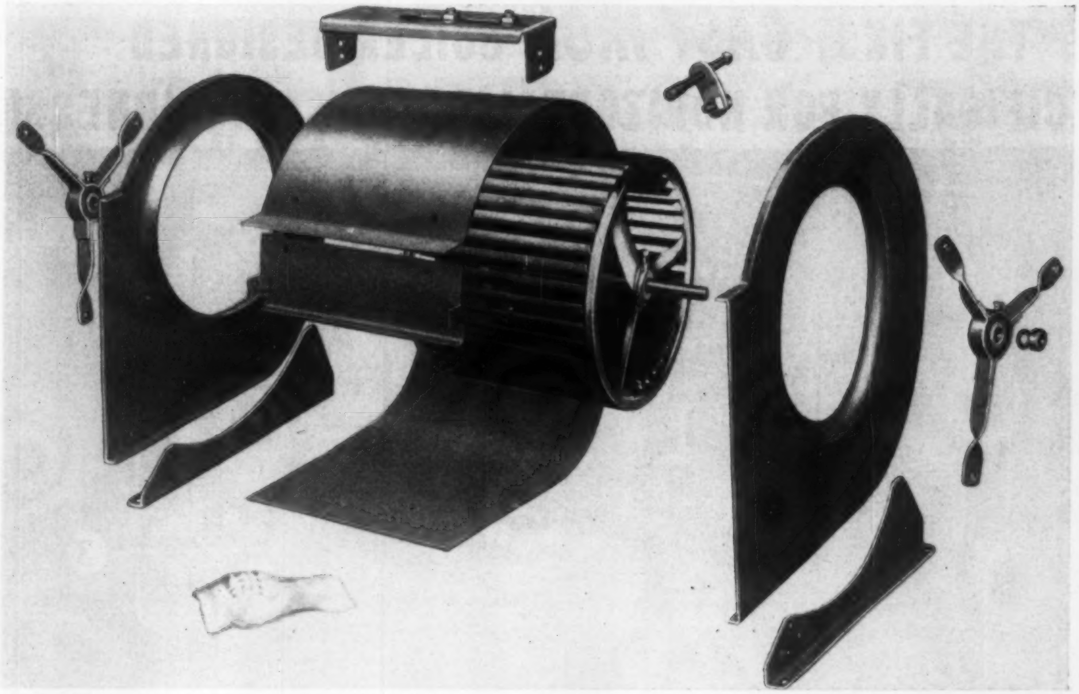
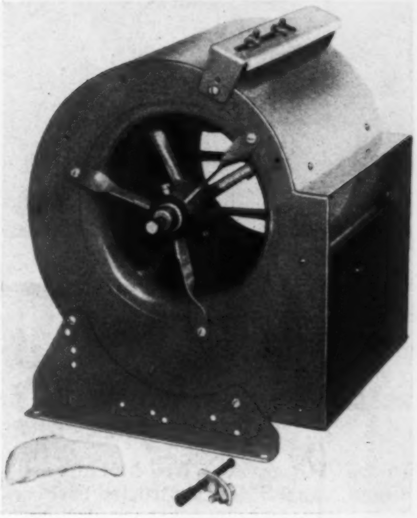
a product of
metals division
OLIN MATHIESON CHEMICAL CORPORATION
Plants • East Alton, Ill.—New Haven, Conn.



MORRISON PARTS OR COMPLETE BLOWER



Most of the Original Equipment Manufacturers we serve prefer Building their Own Blower Assemblies; because of these . . .

4 Definite Reasons

1 Use of "lag time" with no additional overhead.

2 Ease of adjustability to manufacturers' operations.

3 Quality control in every step of assembly.

4 50% savings in dollars expended for Blowers.

Write for literature on Morrison Parts and on Complete Blower Assemblies.

THE MORRISON PRODUCTS, INC. 16816 Waterloo Road
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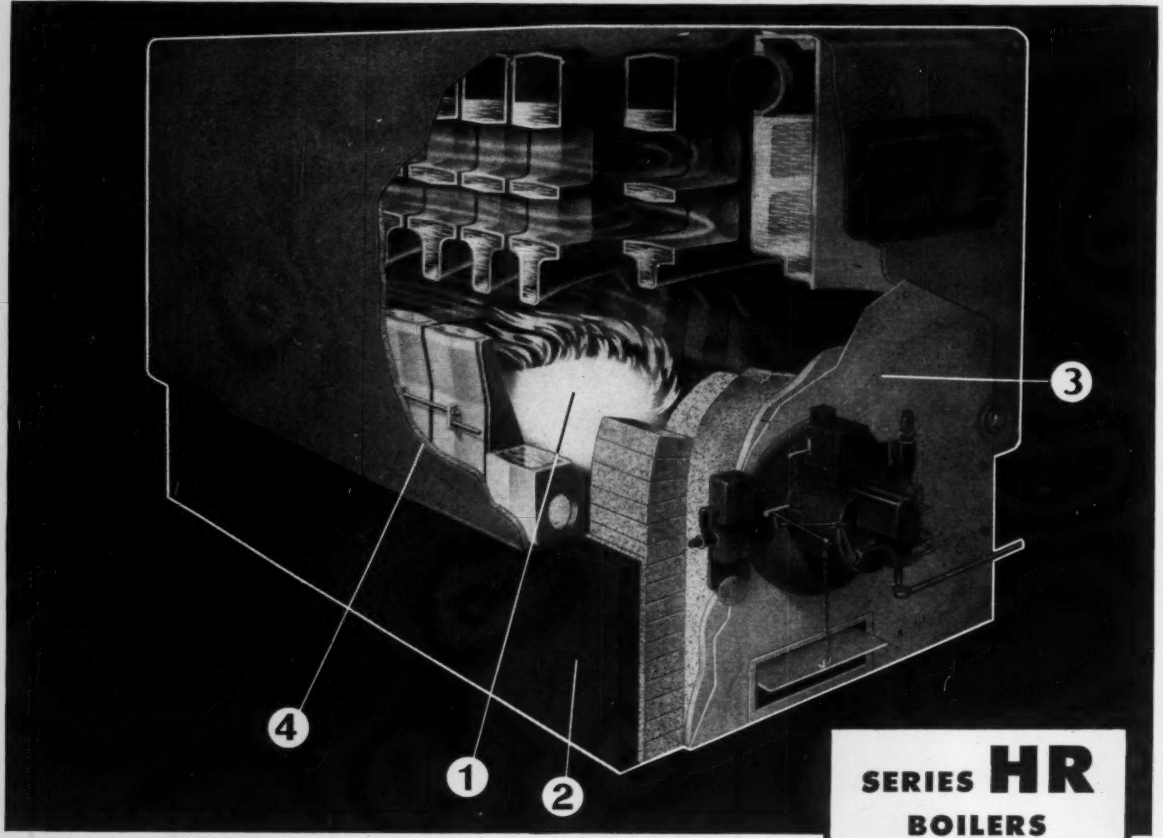
THE FIRST *CAST IRON* BOILER DESIGNED SPECIFICALLY FOR HORIZONTAL ROTARY OIL BURNERS!



SERIES HR BOILERS FOR BURNERS USING HEAVY OILS

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FEATURES!

1. Large fire box volume develops better combustion conditions and maximum radiant heat transfer.
2. High base makes more combustion space available—eliminates high brick foundation.
3. Special steel front plate simplifies installation of rotary burners. Openings can be cut at factory for specific makes.
4. Green enameled steel jacket lined with thick blanket of fibre glass—saves insulating time.

WEIL-McLAIN

PRESENTS A HEAVY DUTY BOILER DESIGNED IN COOPERATION WITH LEADING MAKERS OF ROTARY OIL BURNERS

In the "HR Series," Weil-McLain makes a revolutionary advance in boiler design...an ASME constructed *cast iron* unit engineered to provide the best operating conditions for horizontal rotary oil burners!

The cut-away above illustrates the major features which make the "HR" completely outstanding in performance when fired with burners using heavy oil.

Note also the other Weil-McLain features which contribute to exceptionally high overall efficiency. The curved primary heating surface increases the area directly over the fire...large waterways assure rapid circulation...back and forth, balanced flue gas travel distributes heat equally to all secondary heating surfaces...sectional construction with short draw-rods simplifies erection.

Get the facts—write today for complete engineering data.

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BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

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POWELL VALVES

THE COMPLETE QUALITY LINE

FIG. 1793—Iron Body Bronze Mounted Gate Valve For 125 Pounds W.P.

FIG. 500—Bronze "U.S." Screwed Gate Valve For 125 W.S.P.

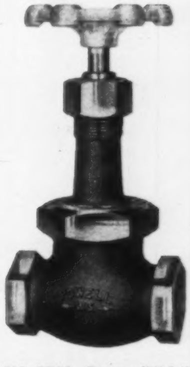


FIG. 2608—Bronze "W.S." Full Flow Globe Valve For 200 Pounds W.P.

FIG. 1561—150 Pound Steel Swing Check Valve

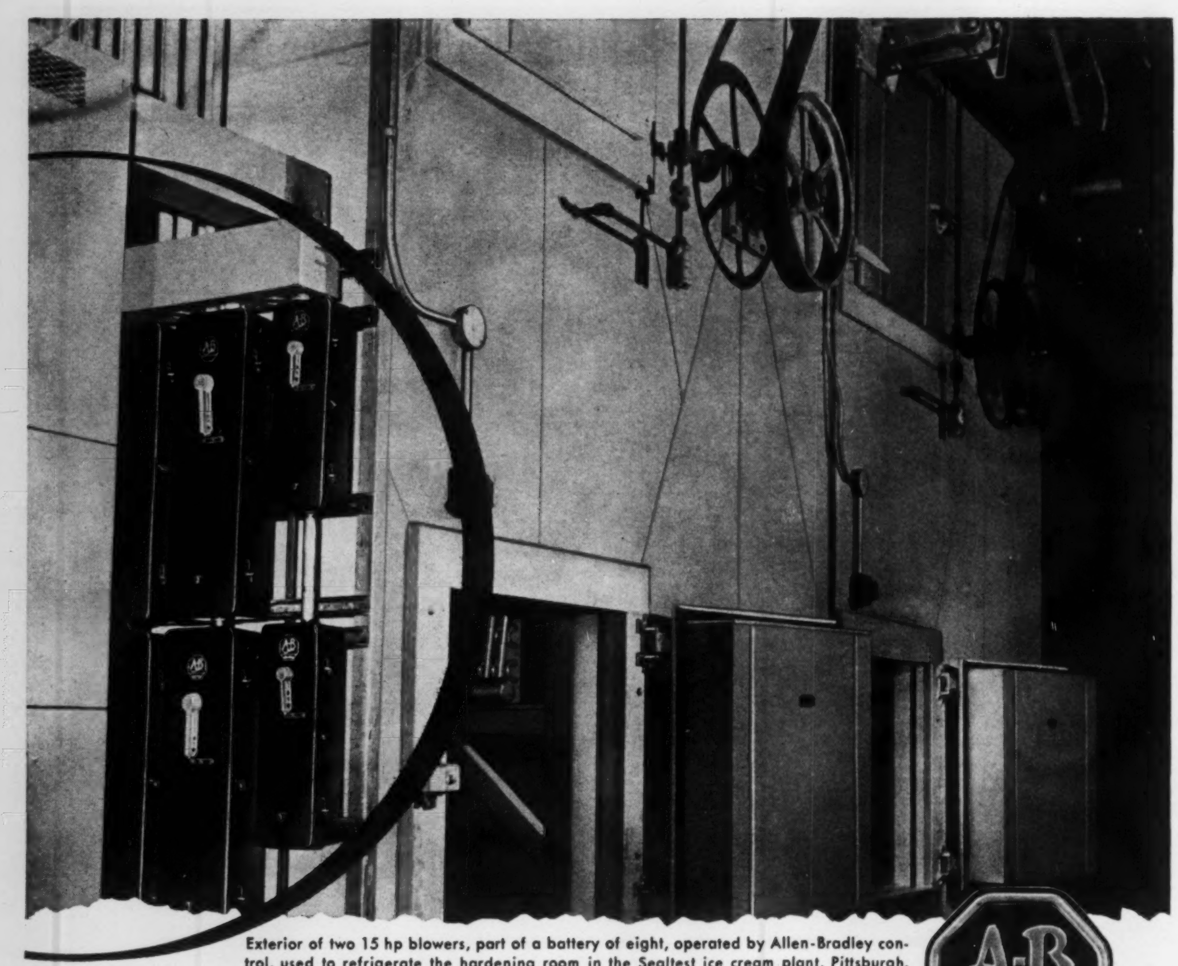
POWELL VALVES . . . THE COMPLETE QUALITY LINE . . . POWELL VALVES

When you think of valves—think of Powell. For Powell can supply exactly the size and type of valves you need. And you can be certain that every Powell Valve will give you dependable flow control.

Shown above are just a few Powell Valves. Investigate these . . . *and* the *complete* line of quality valves that have a proven record of long and dependable service.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our complete line, and help solve any flow control problem you may have. Write . . .

The Wm. Powell Company,
Cincinnati 22, Ohio . . . . . **109th year**



Exterior of two 15 hp blowers, part of a battery of eight, operated by Allen-Bradley control, used to refrigerate the hardening room in the Sealtest ice cream plant, Pittsburgh.

A-B Quality

ALLEN-BRADLEY COMBINATION STARTERS *operate blowers in ice cream plant!*

Simplicity of design is the top requirement of a dependable motor starter. The simple solenoid action of Allen-Bradley automatic starters . . . enclosed arc hood . . . maintenance free, double break, silver alloy contacts . . . reliable solder pot overload relays . . . white cabinet interior . . . bonderized cabinet finish are outstanding features that you secure at no added cost when you buy Allen-Bradley solenoid starters.

Over the years, A-B starters have rendered such continuously reliable service to the air conditioning and refrigeration industry that they have become "an accepted standard."

Allen-Bradley Co., 1335 S. First St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Limited, Galt, Ont.

Why are Allen-Bradley Automatic Starters so Popular for Refrigeration and Air-Conditioning Service?

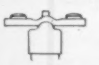
simple design

Only ONE moving part . . . the secret of trouble free operation.

dependable operation

There are no pivots, pins, hinges, or friction parts to cause trouble.

maintenance free contacts



The double break, silver alloy contacts never need cleaning or filing — a timesaver and money saver for you.

reliable overload relays

Provide continuously reliable protection to man, motor, and machine . . . your guarantee of trouble free operation.

ALLEN-BRADLEY QUALITY MOTOR CONTROLS

Refinery proving ground confirms superiority of Triple-Zone Gilsulate for hot underground pipes

> *"...pipes looked absolutely new...insulating efficiency equal to or better than any other...cost of the* GILSULATE *system has been appreciably lower."*
>
> —R. W. AYER, Chief Engineer, Salt Lake Refining Company

Salt Lake Refining Company confirms the findings of hundreds of GILSULATE® installations throughout the country: this *triple-zone insulation* succeeds where others have not fulfilled all operating conditions—*and at lowest cost per installed linear foot.*

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Investigate the values of this easily installed, low-cost insulation yourself. Use the coupon below for complete information, or see your local GILSULATE distributor.

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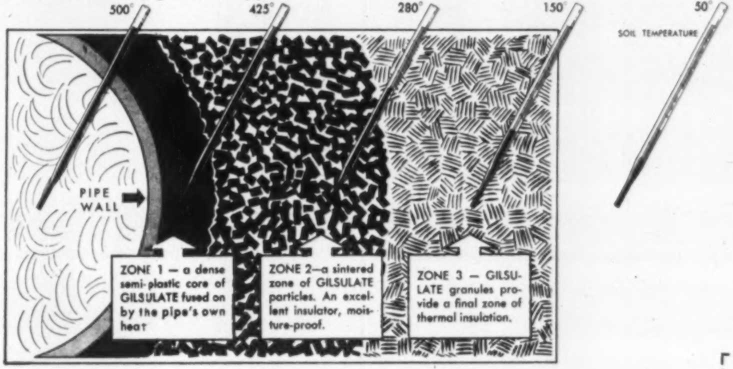
1. *Easy to use*—just pour, tamp and backfill... pipe heat does the rest.
2. *Forms 3 zones of protection* against heat loss and all commonly encountered hazards to hot buried pipes.
3. *Needs no* sleeves or mechanical sheaths: no mixing or special handling.
4. *Needs only* normal pipe spacing: for multiple pipe or cramped conditions.
5. *3 types* for varying temperature ranges up to 520° F.


500°
425°
280°
150°
50°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — a dense semi-plastic core of GILSULATE fused on by the pipe's own heat
ZONE 2—a sintered zone of GILSULATE particles. An excellent insulator, moisture-proof.
ZONE 3 — GILSULATE granules provide a final zone of thermal insulation.

Installing new GILSULATE *system is simply a matter of pouring (note metal forms to conserve material), tamping down...and backfilling.*

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

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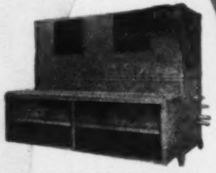
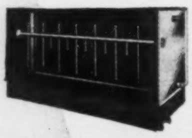
WATER SAVER Model QT. 3 and 5 ton sizes. Bulletin QT-1.



AIR CONDITIONING BLOWER UNITS—13 sizes. 300 to 21,600 CFM. Horizontal or Vertical. Catalog No. AC-1.



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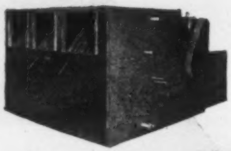

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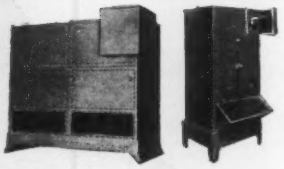

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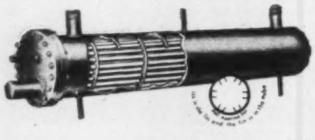

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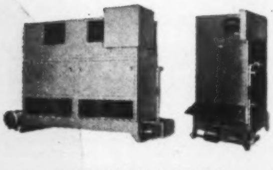

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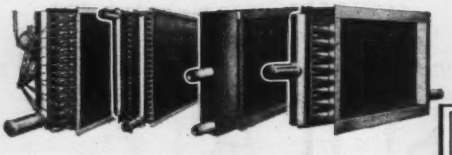

FINNED COILS—Direct Expansion Coils, Water Coils, Steam Distributing Tube Coils, Standard Steam Coils. Sizes up to 36" wide x 120" long. Catalog No. BC-1.

Write for name of nearest representative and catalogs needed.

KENNARD CORP.
1817 S. HANLEY ROAD
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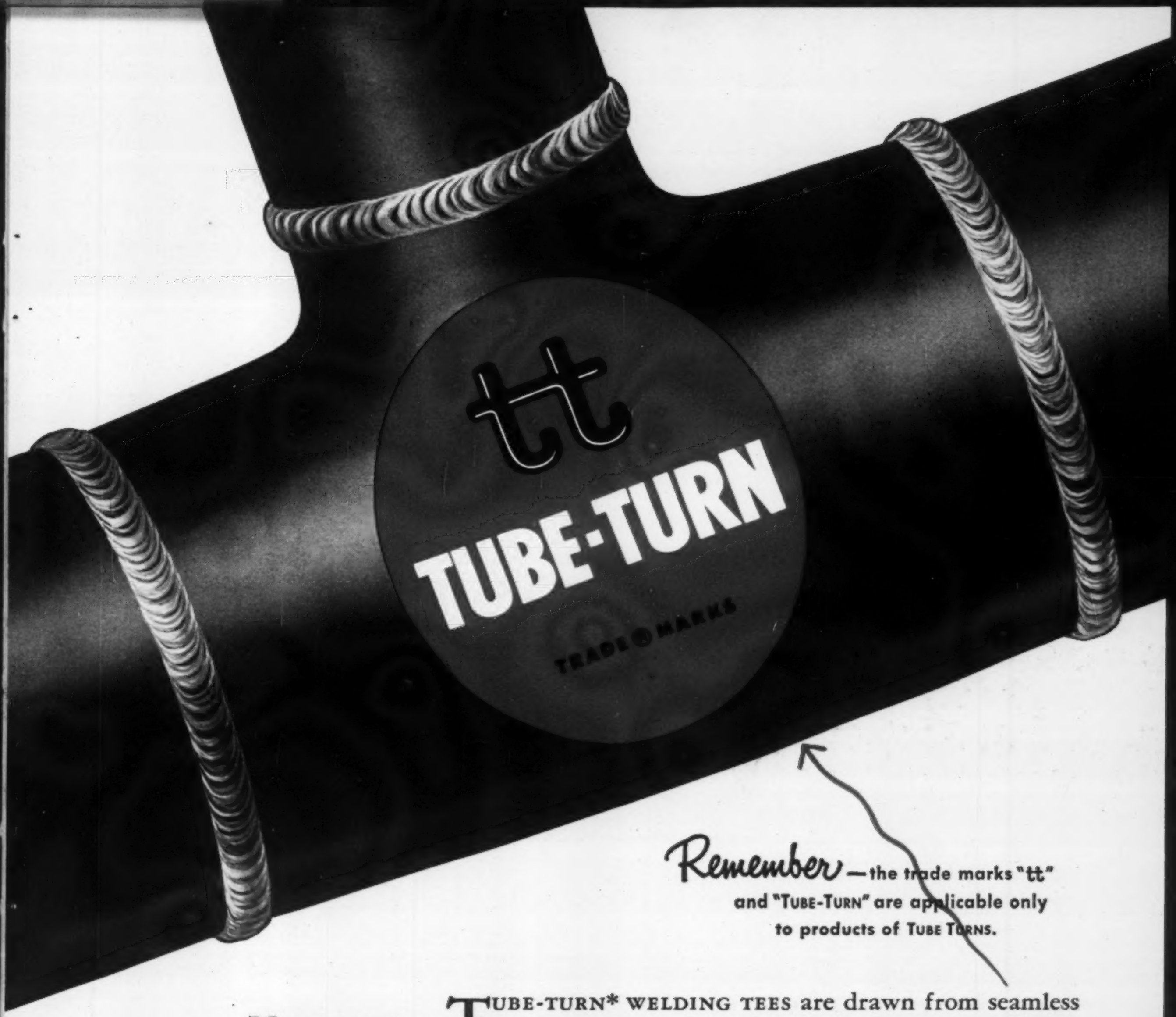

Remember—the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

You get extra strength with The Leading Brand

TUBE-TURN* WELDING TEES are drawn from seamless tubing to a barrel shape. This, and other design features produce high strength—averaging over 25% more than required by applicable standards.

Specify TUBE-TURN Welding Fittings and Flanges for extra values: superior products, the exact fitting or flange you need from our complete line, outstanding engineering service. Call your nearby Tube Turns' Distributor. He is at your service!

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

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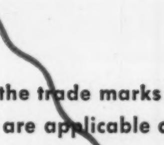
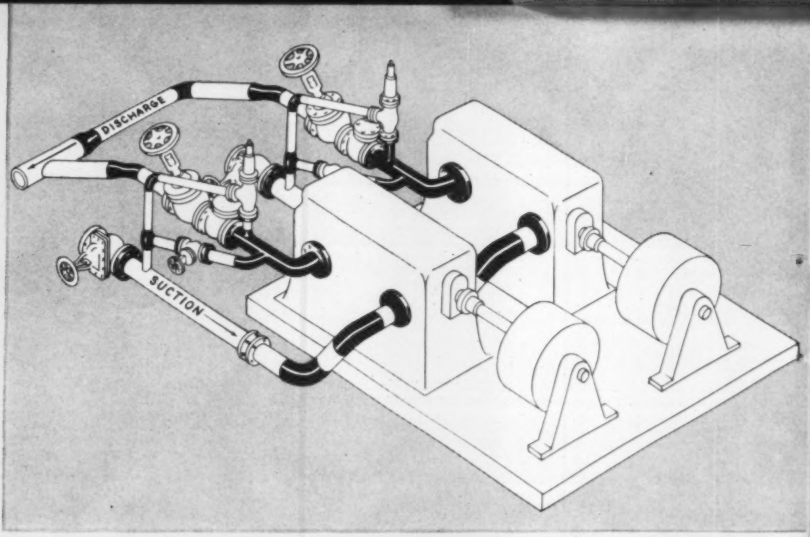
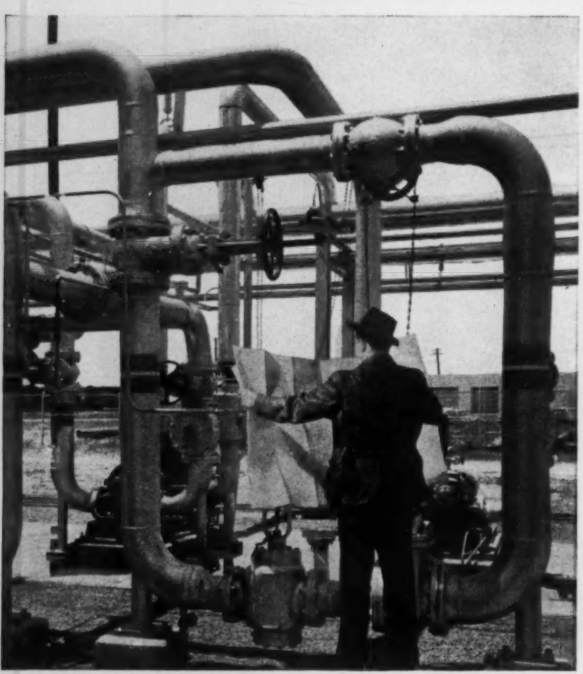


EXTRA VALUES

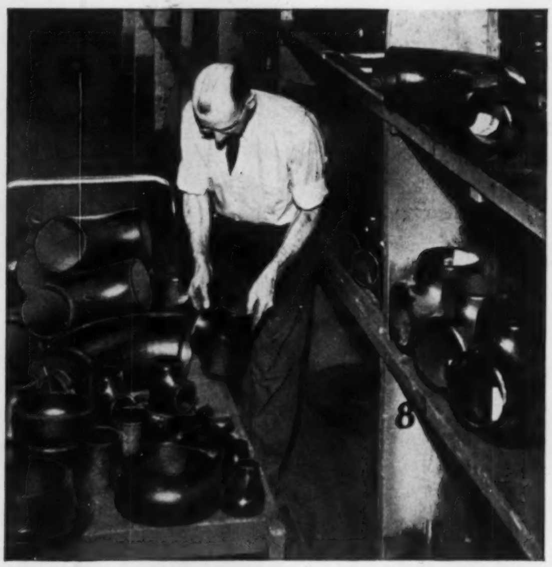
Speed up your piping jobs with TUBE TURNS' SERVICE



ENGINEERING SERVICE—Tube Turns' Engineering Service can help you on your piping projects. For example: Diagram above shows an application where TUBE-TURN* Welding Fittings and Flanges simplified the design and erection of pump piping. They save time, save space, and make the piping permanently leakproof and reliable. Ask your Tube Turns' Distributor to give you the pump piping recommendations of Engineering Service.



COMPLETE LINE SERVICE—You can make sure of getting the right fitting for each job when you specify "TUBE-TURN". This is the world's most complete line of welding fittings and flanges, including more than 4000 items, in all piping materials, schedules, and sizes.



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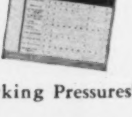
Tube Turns is recognized as a leading source of authoritative information on piping design. For booklet on "Allowable Working Pressures", fill out and send the coupon now.



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TUBE TURNS
A DIVISION OF NATIONAL CYLINDER GAS COMPANY
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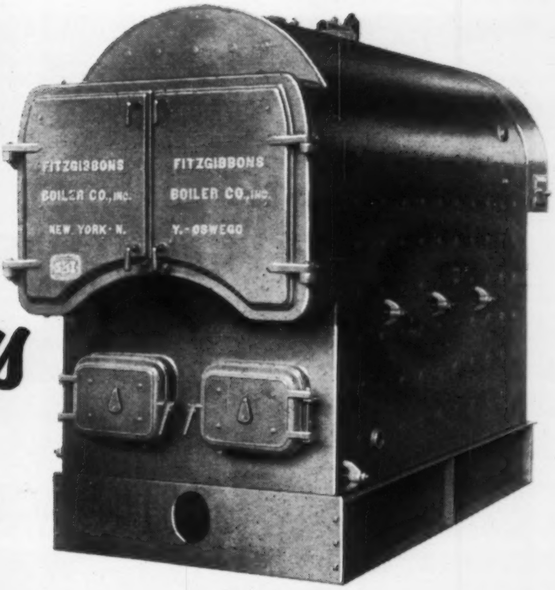

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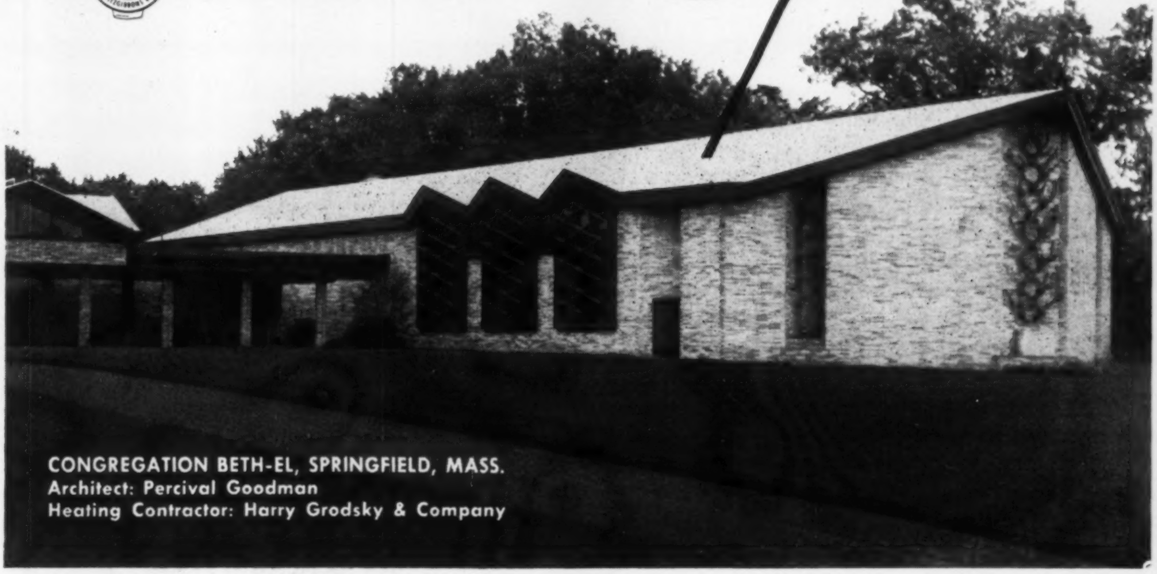
SINCE 1886

The Fitzgibbons Boiler® SBI



CONGREGATION BETH-EL, SPRINGFIELD, MASS.
Architect: Percival Goodman
Heating Contractor: Harry Grodsky & Company

JENKINS REGRIND-RENEW PLUG TYPE VALVES WITH

500 BRINELL *Armor Seat*

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FLOAT CONTROL VALVE

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Plug and seat ring are Jenkins JX500, a stainless chromium alloy steel made to Jenkins high strength specifications, heat-treated to 500 Brinell hardness. Seating surfaces are super-hard and mirror-smooth, offer highest resistance to galling, cutting, abrasion, and erosion . . . and "wire drawing" effects of close regulation of steam.

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LOOK FOR THE JENKINS DIAMOND Jenkins Bros

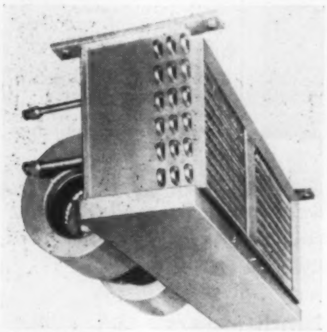
EQUIPMENT DEVELOPMENTS...

For reviews of Recent Trade Literature see Page 210

Molded Plastic Valves, Fittings

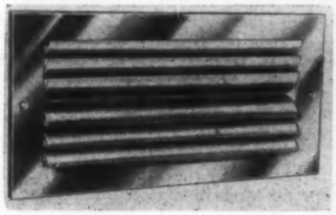
"Luncor," the manufacturer's new line of all molded PVC valves and fittings, has high resistance to corrosive chemical action, according to the company. The completely molded valve, said to be the first ever produced, is designed for pressures up to 125 lb and 150 F and is presently available in a Y-type globe design, the manufacturer reports. A line of fittings of the same material includes caps, couplings, plugs, unions, reducing bushings, flanges, 45 and 90 deg elbows, and tees. Lunkenheimer Co., Waverly and Beckman Sts., Cincinnati 14.

Direct Expansion Evaporators



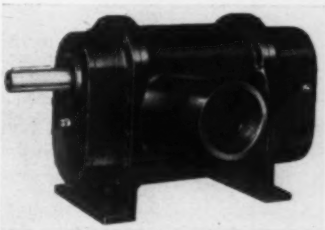
"Hi-F" (meaning high efficiency) is the name applied to a new line of direct expansion evaporators with blowers available in ½, 1, 1½, and 2 ton capacities, the manufacturer reports. Ceiling mounting is designed to permit installation in out of the way places. Units are also available with condensate pump and for cold water, according to the company. Peerless of America, Inc., 5830 N. Pulaski Rd., Chicago 30.

High Sidewall and Ceiling Grille



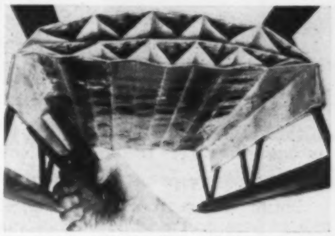
A new series "200" grille, designed to handle the complex demands of distributing both cool and warm air from ceilings and high sidewalls, features adjustability in that all of the louvers can be moved to give one, two or four way diffusion, reports the manufacturer. Applications cited by the company are for overhead forced air systems, high sidewall installations, replacement of old warm air registers when cooling or air conditioning is added, replacement of old style outlets in problem areas to correct chilling or uncomfortable drafts, and bringing in overhead air conditioning where steam or hot water are presently being used. Titus, Inc., Waterloo, Iowa.

Rotary Pump



A new positive displacement rotary pump incorporates a new design and is made in a range of sizes to handle liquid solutions with capacities up to 2200 gpm and pressures up to 1000 psi, its manufacturer states. Under the positive displacement principle, the unmeshing of rubber impellers produces a vacuum drawing the liquid into the space between the lobes (lobe cavity). The liquid is carried between the lobes and case housing to the opposite side of the pump and is then forced into the discharge line. Lindquist Pump Corp., 10001 W. Jefferson Blvd., Culver City 12, Calif.

Fireproof Thermal Insulation

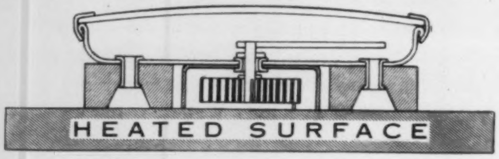


The resistance of asbestos to fire and chemical action is combined with the resistance of multiple accordion aluminum to heat and vapor flow to form the manufacturer's "6AP" and "4AP" fireproof thermal insulation for 16 and 24 in. joist centers. Asbestos partitions create reflective air spaces and keep metal sections separated, preventing metal from touching metal, thereby retarding heat flow by conduction, the company states. Ease in installation is an additional feature cited by the manufacturer. Infra Insulation, Inc., 525 Broadway, New York.

Corrosion-Resistant Coatings

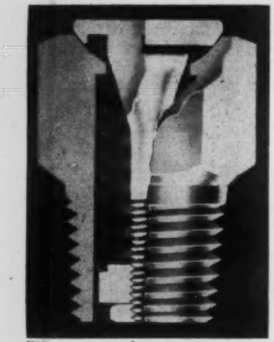
"Porcenells," a new line of inorganic silicate coatings for fusing to ferrous metals at temperatures from 900 to 1200 F, are designed to be corrosion-resistant vitreous coatings that are durable and can be applied to ferrous metals at low firing temperatures, according to the manufacturer. Applications cited by the company are air conditioning cabinets, wall heater grilles, space heaters, furnace casings, ductwork, and flues. Allied Porcenell, Inc., 851 S. Market St., Waukegan, Ill.

Surface Temperature Thermometer



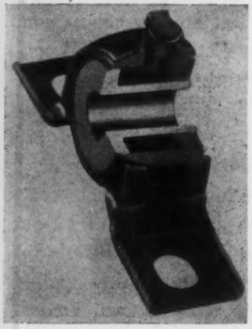
A new thermometer is designed for checking of surface temperatures of platens, die casting dies, rubber and plastic molds and all surfaces where the temperature ranges from 50 to 750 F, the manufacturer reports. The heat sensitive element consists of a bimetal spiral that is closely coupled to the heated surface to be measured and the thermometer is affixed to the surface by means of two magnets. The thermometer reaches stability within three minutes, according to the company. Pacific Transducer Corp., 11921 W. Pico Blvd., Los Angeles 64.

Popoff Relief Valve



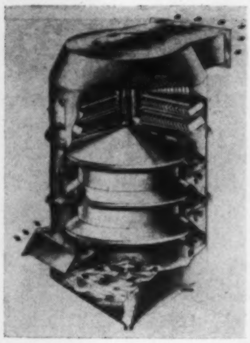
A popoff relief valve of simple construction is engineered to seal tight with no leakage below release pressure and reseat tight within 10 percent of the value, the company states. Sealing is provided by a resilient member fitted into the poppet head which seats into a spherical section in the valve body. The manufacturer recommends these valves for applications where pressures are from 1 to 125 psi and maximum flow and minimum pressure drop are required. Circle Seal Precision Valves, James-Pond-Clark, 2181 E. Foothill Blvd., Pasadena 8, Calif.

Pillow Blocks, Flange Bearings



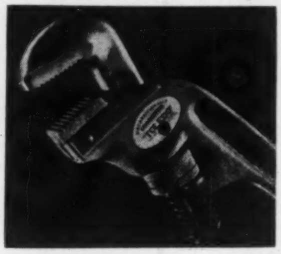
A new line of pillow blocks and flange bearings, engineered "to provide much longer operating time before re-lubrication than most conventional bearings," are of a new wicking material, the manufacturer reports. "Permawick," as the material is called, has a high tenacity for oil and resists high operating temperatures, says the company. Uses cited by the manufacturer are for fractional horsepower applications on heating and ventilating equipment. Congress Drives Div., Tann Corp., 3750 E. Outer Drive., Detroit 34.

Dust and Fume Collector



Consisting of a cylindrical drum with a series of cones and baffles, a new wet type dust and fume collector is supplied with water which produces a series of closely related water curtains through which dust laden air is filtered in its upward travel, according to the manufacturer. A double row of moisture eliminators are mounted above the washing chamber. The baffle design sets up a cyclonic washing action and turbulence, separating the wet dust and carrying it to the sludge tank below, says the company. Van-Truer Co., Inc., 12600 Beech Rd., Detroit 23.

End Wrench for Pipe



A new end wrench, designed with an off-set handle to permit use on pipe in coils or against flat surfaces, has been added to the manufacturer's line of heavy duty pipe wrenches, the company reports. A single spring that will not hang up on small sizes facilitates quick and easy setting of jaws, the manufacturer says. Wrenches are available in 8, 10, 14 and 18 in. sizes. Toledo Pipe Threading Machine Co., 1445 Summit St., Toledo 4.

Packaged Air Conditioners

A complete line of packaged air conditioning units requiring no water is designed for use in stores, offices or other large spaces where water may be limited or where there may be piping difficulties, the manufacturer reports. Employing air cooled refrigeration, units are in four sizes from 2 to 7½ hp, according to the company. The air cooled condenser can be installed on a roof or setback or inside the building with ducts to supply outside air, the manufacturer states. Carrier Corp., 300 S. Geddes St., Syracuse 1.

Electric Baseboard Heaters

New electric baseboard heaters are designed to provide low level perimeter heat that is automatically controlled at the desired level by thermostat, the manufacturer states. The units have cast aluminum heating elements and insulated, embedded and sealed electric wires. The basic heater is 32 in. long, 8½ in. high, and 3 in. wide, with a capacity of 600 watts, and operates on 120 or 240 volts. Electromode Corp., 45 Crouch St., Rochester 3, N.Y.

How to exhaust fumes from boiling brass . . . without hoods

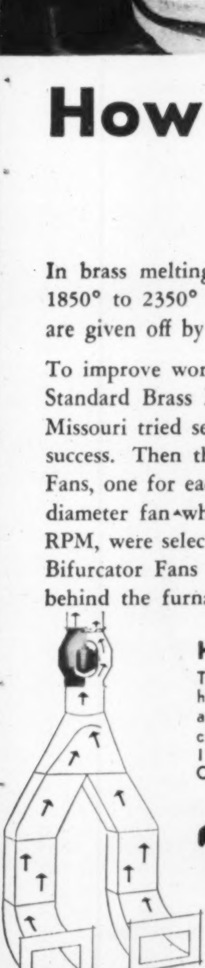
In brass melting furnaces, normal temperatures run from 1850° to 2350° F. Terrific heat and irritating fumes are given off by these open furnaces.

To improve working conditions around their furnaces, Standard Brass Manufacturing Company of Kansas City, Missouri tried several fan and hood systems without success. Then they installed five DeBothezat Bifurcator Fans, one for each two furnaces. Bifurcators with 27″ diameter fan-wheels and 2 HP motors, operating at 1140 RPM, were selected. The high velocity of these DeBothezat Bifurcator Fans made it possible to use open ducts behind the furnaces in place of hoods above them.

Now working conditions around the furnaces are satisfactory. And furnace charging and unloading is safer, easier and faster *without hoods.*

DeBothezat Bifurcator Fans are ideal for installation where space is limited, because they are compact, and install right in the duct work. Bifurcator Fans can be made of carbon steel, stainless steel, rubber coated steel, monel metal and many other corrosion or heat-resistant materials.

If you have a fume removal problem, DeBothezat Bifurcator Fans may be the answer. Write our factory for illustrated catalog DB-4-53.



HOW BIFURCATOR WORKS

The Bifurcator is a motor driven axial-flow fan in a patented, divided housing. Motor is in an isolated chamber around which flue gases are by-passed (bifurcated) so that the motor always remains cool, clean and accessible. Bifurcators are available in many sizes from 1140 CFM (12″ diameter fan with 1/20 HP motor) up to 45,000 CFM (48″ diameter fan with 20 HP motor).

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

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American Machine and Metals, Inc.
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Send me free Catalog DB-4-53 containing full data on Bifurcators.

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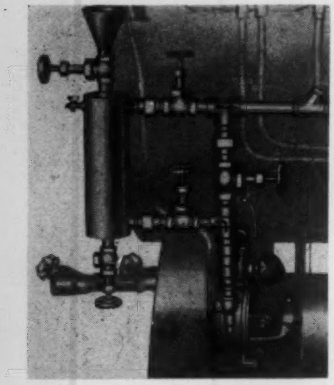
NAME AND TITLE ______

Water Treatment Unit

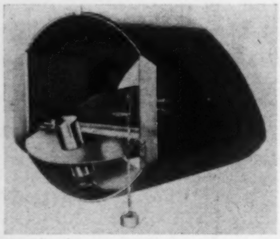


The "Chemical By-Pass Feeder," a water treatment device for use where water or boiler conditions do not justify more elaborate mechanical proportioning equipment to treat boiler make-up water, avoids excessive feed pump wear by introducing water treatment compounds on the discharge side of the boiler feed pump, according to its manufacturer. Having a capacity of 2 gal, the unit is designed to add either liquid or powdered chemicals on any hot water or steam generator. Cyclotherm Div., United States Radiator Corp., 157 E. First St., Oswego, N.Y.

Bench Type Pipe Cutter

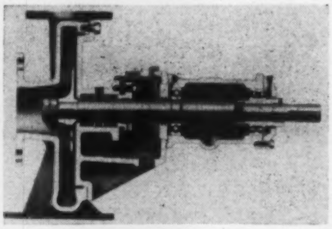
A new bench type pipe and tube cutoff machine will cut up to 1000 pieces of 1¼ in. OD pipe per hour, according to its manufacturer. The machine is designed to cut all sizes from ⅜ to 1¼ in. OD pipe and tubes, from light gage to 12 gage wall thicknesses. Drive is by a ¼ hp gear headed motor. The tempered cutting wheel has a 7 in. diameter. Continental Machine Co., 1952 N. Maud Ave., Chicago 14.

Draft Control



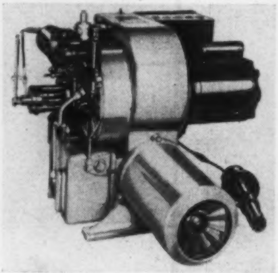
The "MG" draft control for gas fired heating plants is being manufactured in an 8 in. size, giving the company a size range of controls from 8 to 24 in. The 8 in. gate is 20 gage steel, with a 12 gage ring and 18 gage side plates. The series is a double acting control with the gate opening inward to regulate updrafts and opening outward to relieve downdrafts, the company reports. An optional safety switch closes the main gas valve in the event of a prolonged downdraft, says the manufacturer. Field Control Div., H. D. Conkey & Co., Mendota, Ill.

New Chemical Pumps



Chemical pumps, a new addition to the manufacturer's line, are engineered for handling acids and other corrosive chemicals, the company states. Four basic sizes, in various motor and impeller combinations, cover a capacity range from 20 to 400 gpm. The complete pump rotating element, bracket and stuffing box assembly can be removed as a unit, without disturbing the suction or discharging pipe, according to the manufacturer. Units are available in a special alloy for high corrosion resistance and in cast iron for general service. Byron Jackson Co., P.O. Box 2017, Terminal Annex, Los Angeles 54.

Oil Burner



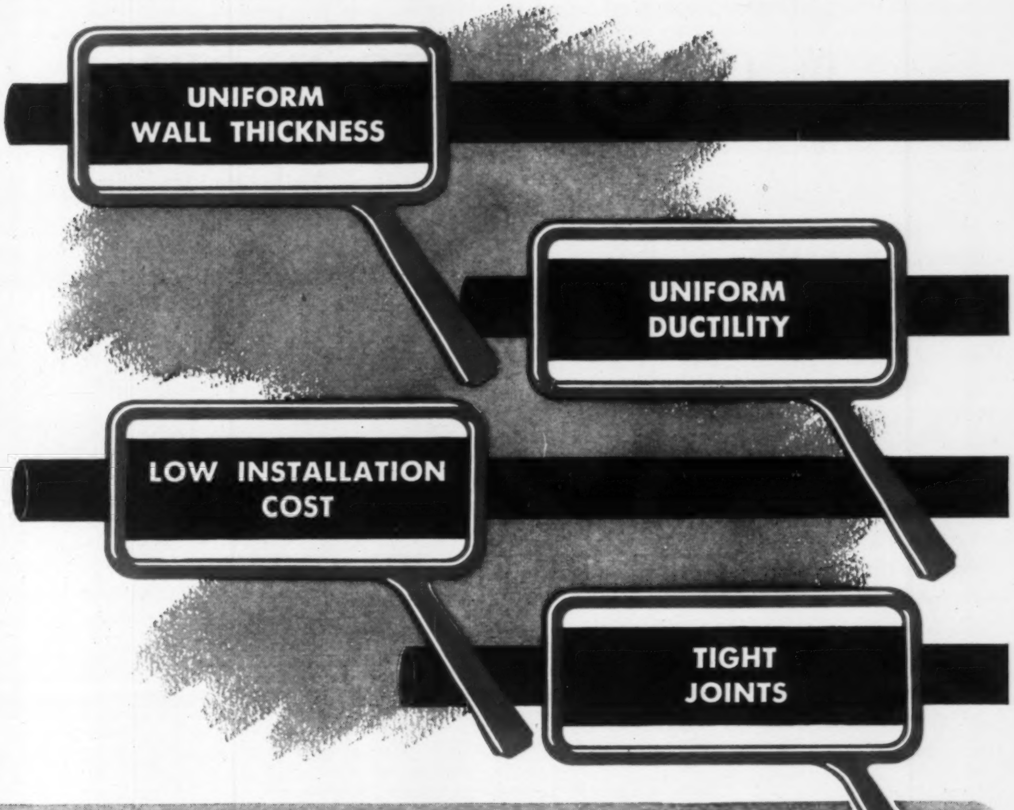
The manufacturer's new "3" oil burner incorporates many features formerly found in the larger burners of the same line and offers safety and economy features, the company states. The unit is designed for installation in small buildings having a net standing radiation of 3800 sq ft or 35 boiler hp. It is a low pressure air atomizing type burner with all electric ignition and is designed to burn Nos. 4 or 5 heavy oil without preheating, says the manufacturer. The burner is available as a packaged unit. Cleaver-Brooks Co., 326 E. Keefe Ave., Milwaukee 12.

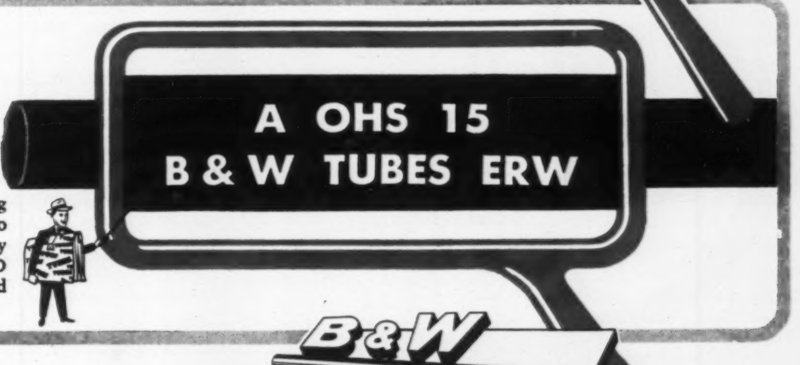
Halide Refrigerant Leak Detector

A flame heated copper plate in the halide leak detector's chimney causes a change of color and intensity in the unit's flame to locate noncombustible halide refrigerant gas leaks in air conditioning and refrigeration units, the manufacturer reports. The chimney is connected by a brass burner and tube to a disposable steel cylinder of propane gas. The rubber search hose is attached to the burner unit by a flexible metal hose connection. A special washer to prevent leakage and a relief valve are features, cited by the company, which provide for safety during storage periods. Otto Bernz Co., Inc., 2800 Lyell Ave., Rochester, N. Y.

(Continued on page 184)

What to Look for in a Boiler Tube


UNIFORM WALL THICKNESS
UNIFORM DUCTILITY
LOW INSTALLATION COST
TIGHT JOINTS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B & W TUBES ERW
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SEAMLESS and WELDED
TUBES

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illinois ENGINEERING

Random Thoughts from a Filter Engineer

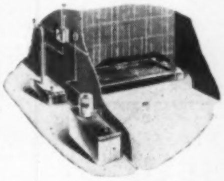
by Ned Lamprecht

- **NEW IDEA IN WASHING ELECTROSTATIC PRECIPITATORS**
- **DO AUTOMATIC SELF-CLEANING FILTERS REALLY STAY CLEAN?**
- **IS IT TRUE WHAT THEY SAY ABOUT "SELF-CHARGING ELECTROSTATIC" AIR FILTERS?**

NEW IDEA IN WASHING ELECTROSTATIC PRECIPITATORS

They say there's nothing new under the sun. But we think that occasionally someone does come up with a new wrinkle. To wit, our washers for electrostatic precipitators.

In designing them, two problems loomed up big. How to design a washer that would take up the least space. And how to concentrate the available water pressure to get the greatest efficiency. We think we've licked both problems in Air-Maze automatic and semi-automatic washers for the Electromaze.

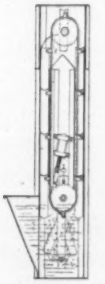


Cutaway view of typical Electromaze assembly with semi-automatic service system.

First, the moving headers are located *underneath* the precipitator instead of in front of or behind it. Only a few inches in height are used and none in depth. And because the headers are smaller, extending only the depth of the unit, the water pressure exerts more washing force. With this arrangement, the water washes two ways—both going up and coming down. None of the water or adhesive spray is wasted by going into the front of or back of the duct.

DO AUTOMATIC SELF-CLEANING FILTERS REALLY STAY CLEAN?

We can't give a run-down on the whole automatic filter industry but we can report on Automaze, our automatic self-cleaning air filter. It does stay clean, *really* clean! We've made numerous checks of actual installations, to be sure. The results were always the same. After months of operation in the dirtiest locations, the individual panels were removed and they looked almost the same as they did the day they were made.



Automaze

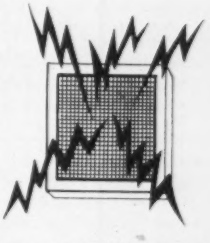
The secret, of course, is Air-Maze's exclusive "pulse-type" action. Each filter panel in the revolving curtain is submerged in the cleaning tank and vigorously agitated 6 or more times by a compressed air drive. In this way, each panel is thoroughly cleaned and recharged with adhesive. If you're interested, why not let us send you our catalog, telling the complete Automaze story?

IS IT TRUE WHAT THEY SAY ABOUT "SELF-CHARGING ELECTROSTATIC" AIR FILTERS?

We decided to find out, once and for all, just how well a "self-charging electrostatic" filter would perform. They had talked a good filtering job and the "self-charging" idea certainly sounded intriguing. But could their performance match their claims? We decided to find out. So we bought three different brands to see how they ticked.

First, we borrowed a voltmeter so sensitive that it registers when you scratch your hair 20 feet away, and we tried to get a reading from the filters. No success. We couldn't get the needle to move, even when passing air through the "filters".

But, since performance is proof of the pudding, we tested one of them with the National Bureau of Standards Discoloration Method, using outside air—the test normally used for electrostatic filters by the U. S. Government. We have a dual-duct test set-up and placed one of our Electromaze* electrostatic precipitators in one duct and the "self-charging" panel in the other so the test could be made simultaneously. The Electromaze filter was 93.8% efficient; the "self-charging" filter was only 10.7% efficient.



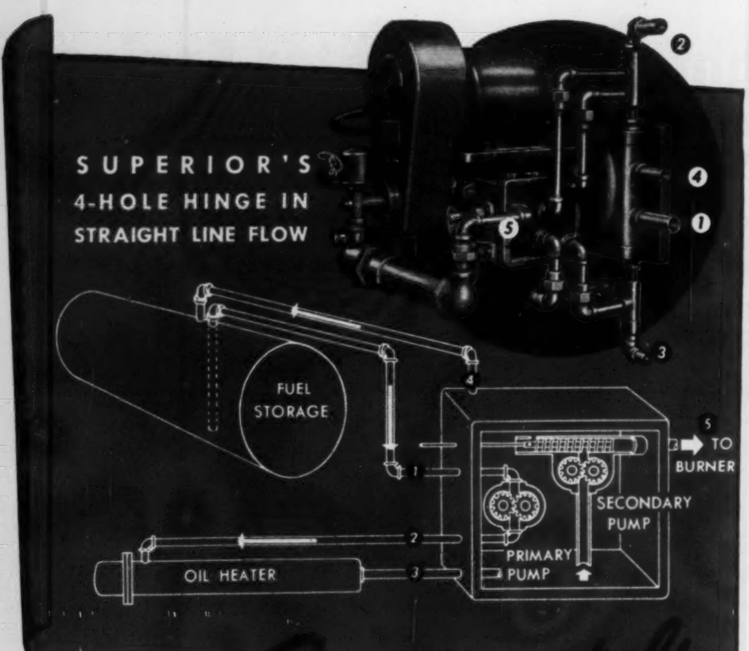
We want to be open-minded about "self-charging" filters but, on the evidence so far, we have to question whether they live up to their claims. The Air-Maze Corporation, 25000 Miles Avenue, Cleveland 28, Ohio.

*This unit uses 10,000 D.C. voltage.

AIR-MAZE

The Filter Engineers

AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS



Sound Fundamentals

GIVE **SUPERIOR** ROTARY BURNERS

DEPENDABILITY *and* EFFICIENCY

- Time-tested horizontal-rotary design.
- V-Belt Drive for the high cup speed essential to efficient atomization.
- Four-Hole Hinge circulates oil through oil heater so that hot oil is on the *pressure* side of the pump, allowing you to burn oil at higher temperatures.
- Adjustable Air Nozzle provides accurate control of flame contour.
- Dual Pumps and Reservoir combined with Constant Oil Rate Control provide controlled firing regardless of viscosity variation.
- Burn any grade of oil. Also available with combined gas burner for any type of gas.
- Fully automatic in sizes to 500 bhp with dual ignition, and hi-low or fully modulating control.

Superior's 4-Hole Hinge illustrates the point. It has the effect of placing the primary pump (which is enclosed in the reservoir) between the fuel tank and oil heater. Oil is brought to the reservoir by suction and *pushed* through the heater. This system relieves the pump of the unnecessary strain of pulling cold oil through the heater, and allows unlimited heating of the oil. The hinge also eliminates the need of breaking connections when the burner swings out of firing position.

The 4-Hole Hinge is but one of the sound fundamentals which give Superior Rotary Burners the dependability and efficiency which result in years of satisfaction. Write today for Catalog 1604.

for performance you can **BANK** *on*

SUPERIOR ROTARY BURNERS

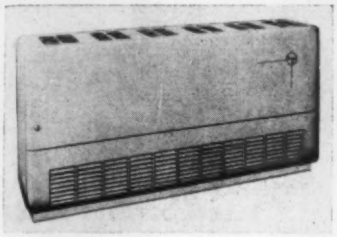
SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 18, N.Y.

EQUIPMENT DEVELOPMENTS

From p. 180

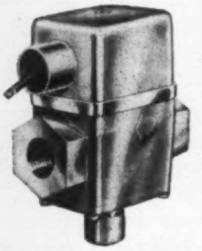
Console Heaters

The new "Herman Nelson" line of cabinet type, console heaters, in a range of seven colors, has the following features, says the manufacturer: A removable base for wall-hung units; a key operated two speed key switch that is operated through the grille, removing the need for an access door; a one piece front panel for recessed wall or ceiling applications; and, easy access to all parts by the removal of two chrome plated, key operated screws on the front panel. Heating and Ventilating Dept., American Air Filter Co., 215 Central Ave., Louisville 8.



Solenoid Gas Valve

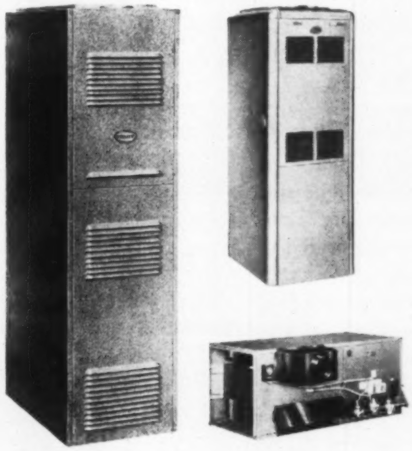
A new solenoid gas valve is designed for use on gas burning equipment and with all types of gases. Corrosion-resistant construction makes the valve suited for use with "sour" gas, the company states. Other features cited by the manufacturer are soft seat construction, quiet operation and positive shutoff. The valve is available in ½ and ¾ in. sizes, 24 or 115 volts and with or without a manual opener. Crise Controls Div., Acro Mfg. Co., Columbus 16.



Self Flaring Fittings

A line of self flaring, pressure tight fittings is available in ¼, ⅜ and ½ in. sizes and in a variety of types and materials, the manufacturer reports. With no flaring tools necessary, the operator inserts the tube into the

"good reason for the different shapes"



UTILITY'S HORIZONTAL AND VERTICAL FURNACES

No matter where, no matter why, there's a specially-designed Utility forced-air furnace to fit the job. Utility's engineers have created units that operate just as effectively in horizontal or vertical positions.

For space-saving efficiency, where quality counts, Utility's vertical furnace takes honors. In capacities of 70, 85, 100, 135, 165 and 200,000 BTU, it can be installed in closet, alcove or service porch.

Where there's seemingly no room at all, any nook or cranny will do for Utility's horizontal furnace. It works equally well from a spot in the attic, under the floor, under the staircase or even suspended from the ceiling. This is the one you choose when a remodeling job or new home has utilized every bit of floor space for living.

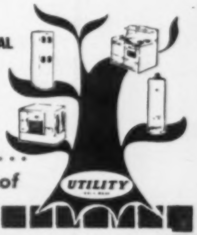
For the newest and most economical perimeter method, Utility has engineered 70,000 and 105,000 BTU counterflow furnaces for installation with minimum amount of duct work.

Whatever the shape, these furnaces have automatic controls, carry a certificate of guarantee and are completely self-contained. All AGA approved.

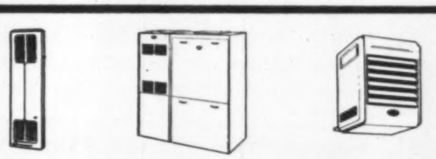
UTILITY
TRADE MARK
Guaranteed heating performance

GAFFERS & SATTLER And OCCIDENTAL
Automatic Gas Ranges

UTILITY
Furnaces • Air Conditioners
Air Coolers • Water Heaters



a happier living family tree . . . all branches of



See the complete UTILITY heating and air conditioning line now

UTILITY APPLIANCE CORP., Dept. HPH2
4851 S. Alameda St. • Los Angeles 58, Calif.

Please send me full information on:

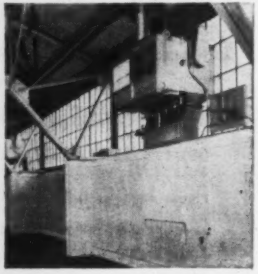
☐ Utility Automatic Heating and Air Conditioning Equipment
☐ Utility Cooling Equipment
☐ Utility Automatic Gas Water Heaters

NAME________________
ADDRESS________________
CITY__________ ZONE____ STATE______

HEATING PROBLEM: How to dangle Navy Pier into icy Lake Michigan and still keep it warm.
THE SOLUTION:
Janitrol
GAS-FIRED UNIT HEATERS

This exhibit hall required enough heat for 480 average homes during large winter conventions! The same heating system had to quickly modulate for smaller exhibits and also provide summer ventilation. In 1936, Janitrol Gas-Fired Unit Heaters were specified and today 117 units are performing with minimum maintenance and complete satisfaction.

For heating that's engineered to your job, check Janitrol. For more information, write for "Businessman's Blue Book of Better Heating".



Twin Janitrol Unit Heaters, placed overhead along the outer walls of Navy Pier, heat and circulate 5,800 cubic feet of air per minute!

Janitrol
GAS-FIRED UNIT HEATERS

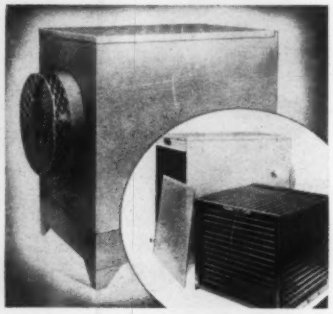
Janitrol Heating
& Air Conditioning Division
Surface Combustion Corporation
Columbus 16, Ohio
In Canada: Alvar Simpson Ltd.
Toronto 13

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES *Kathabar* HUMIDITY CONDITIONING

fitting and tightens the nut with ordinary wrenches. The tube is flared automatically inside the fitting, the company says.

Among the types of "Flare-Matic" fittings are male, female and union connectors, 90 deg male elbows and tees. Century Products, 315 S. 15th St., Philadelphia.

New Design in Cooling Towers



Of aluminum and stainless steel construction the manufacturer's newly designed towers have features which provide 2, 3 or 4 ton capacities by interchange of fan blades only, according to the company. The all aluminum wet deck cartridge slides out on stainless steel rails for cleaning or replacement, says the manufacturer. A baked-on plastic coating gives protection to surfaces exposed to recirculated water. Silvercraft, Inc., 120 S. Floyd St., Louisville.

Portable Pipe Machine

"Pipe Master," a new portable pipe and bolt threading machine, is engineered to ream, thread and cut off all sizes of pipe from 1/8 to 2 in. and will drive geared die stocks and cutters up to 12 in. through a special drive shaft, its manufacturer states. The unit has a 1/2 hp universal geared head, variable speed motor. It is equipped with a floating type, adjustable die head and a wrenchless front chuck, says the company. The Oster Mfg. Co., 2057 E. 61st Pl., Cleveland 3.

Circuit Breaker Safety Switch

A 100 ampere circuit breaker safety switch, said to occupy less space than comparably rated fused switches, is designed for service on 120/240 volts a-c, in two or three wire installations, the company states. It incorporates two single pole hydraulic-magnetic circuit breakers with handle extensions attached to form one double pole unit. This allows both circuit breakers to be switched on or off together, according to the manufacturer. Heinemann Electric Co., 497 Plum St., Trenton 2.

PRUDENTIAL—
AN EXAMPLE OF
AIR CONDITIONING
AT ITS BEST

Yes, there is a difference in air conditioning, just as there is in heating, automobiles, housing . . .

True comfort means maintaining BOTH HUMIDITY and temperature at optimum levels.

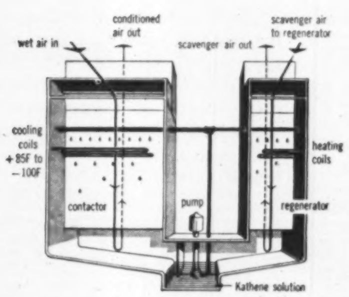
The Prudential Insurance Company of America has the right idea . . . direct dehumidification for humidity control, conventional cooling for temperature control. Here's how. Kathabar units continuously dehumidify a supply of outside make-up air to a moisture level which absorbs the moisture load of the entire building. This is done economically, with cooling tower water.

The air then is sensibly heated or cooled as needed in tempering coils, located throughout the building. Since the air is dehumidified before cooling, the surfaces of these coils are *dry*. Result, no musty odors, bacteria at a minimum, health at a maximum.

It pays to buy the best when selecting air conditioning. The combination of Kathabar for humidity control and conventional refrigeration or well water for temperature control is simple, economical. It is creating new high standards in air conditioning throughout the country.

The team has been equally effective in many industrial process air conditioning applications where dry air and/or low temperatures are required. Literature group K-54-8—which includes our new brochure "Humidity Conditioning"—will give you the complete story.

WHAT COULD BE SIMPLER?

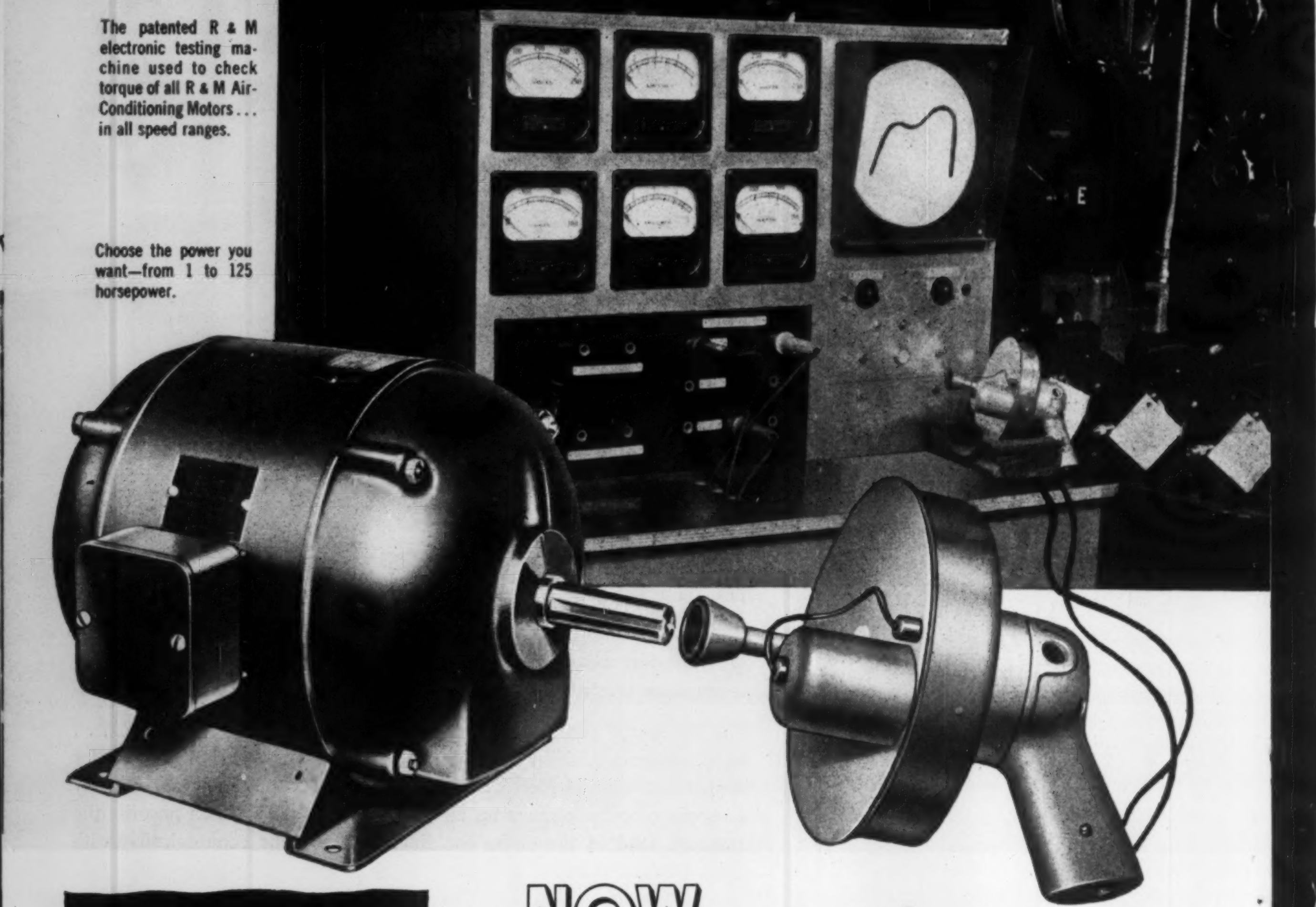


Air to be conditioned passes through the contactor, where an absorbent solution removes moisture (the amount depends on the automatically-controlled temperature of the solution). In the automatic regeneration, about 15% of the solution is heated, and the moisture it releases is blown out the window.

Kathabar®
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF *Surface* INDUSTRIAL FURNACES *Janitrol* AUTOMATIC SPACE HEATING



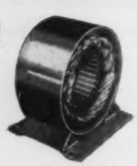
The patented R & M electronic testing machine used to check torque of all R & M Air-Conditioning Motors . . . in all speed ranges.

Choose the power you want—from 1 to 125 horsepower.

NOW ...get the torque YOU want...by specifying ROBBINS & MYERS!

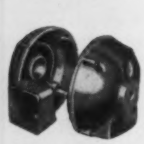
"Weatherized" inside and out—

AT NO EXTRA COST!

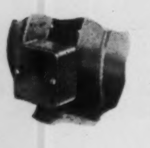


Steel parts undercoated with baked-on "Robbinite."

Rotor and shaft assembly sprayed with special rust inhibitor.



Cast-iron parts get special anti-corrosion treatment.



Terminal box—cast-iron—gasketed; leads sealed. Repellent grease keeps moisture out of bearings.

R & M motors have not only the right construction features for air-conditioning service, but the right *torque characteristics* as well.

That's because we have completely eliminated guesswork in determining the starting and acceleration performance of our induction motors. Tested by a unique electronic machine over the entire speed range, each motor *shows* its own *complete* accelerating curve, including that part which is almost impossible to obtain by other methods.

For you, this means your R & M motor will not "hang up" at some low speed—the "dips" have been designed out. And this patented speed-torque tester proves it!

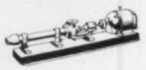
And, here's something you'll want to know about *installation*. You can reconnect—*on the job*—all R & M standard 220/440 volt motors for 220 volt part-winding increment starting. Thus, only half normal starting current is drawn—without need for autotransformers or resistors.

Want more details? Write for Bulletin 400HP, showing all the advanced construction features of R & M motors. It costs you nothing, of course, to find out about the finest air-conditioning motor your money can buy!

ROBBINS & MYERS, INC.

MOTOR DIVISION · SPRINGFIELD, OHIO · BRANTFORD, ONTARIO

Fractional & Integral H.P. Motors & Generators



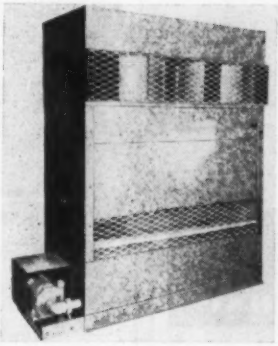
Moyno Pumps

Propellair Industrial Ventilating Equipment

Electric Fans

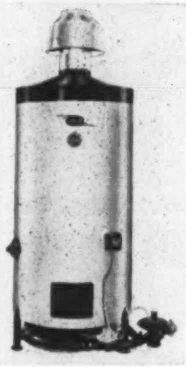
Electric & Hand Hoists & Cranes

Cooling Towers



New 2, 10 and 15 ton models of the manufacturer's "Flow-Cold" line of cooling towers have blowers engineered to achieve quiet, efficient operation with or without ductwork, the company reports. Of galvanized finish to make them rust- and corrosion-resistant, units can be installed indoors or outdoors, according to the manufacturer. Large cooling capacities in minimum tower sizes are accomplished by a wetted metal deck principle of heat transfer and compactness of the unit, says the company. Acme Industries, Inc., Jackson, Mich.

Copper Plated Water Heater



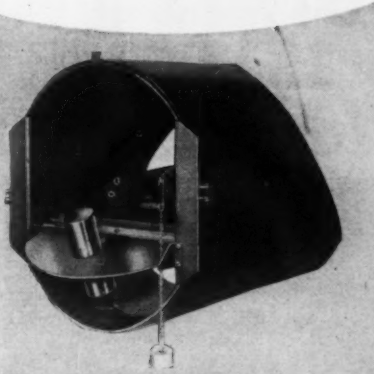
Basic copper is bonded to the steel plate of a new water heater designed for installation in hotels, office and other commercial and industrial buildings, its manufacturer announces. Made in two sizes, the larger can produce 500,000 Btu per hr, and turn out 420 gph on a 100 deg rise, according to the company. Capacities of the smaller unit are slightly more than half of these. The unit's greater number of smaller and longer tubes provides greater distribution of heat and more hot water, the manufacturer states. Riverside Boiler & Engineering Co., Inc., 4725 N.E. 28th, P. O. Box 7141, Ft. Worth.

Stud Welding Gun

The manufacturer's "NS-9," a new model stud welding gun, is available with cable and controls in two sizes, one for studs with diameters up to ½ in., and the other for sizes ranging from 10 gage up to 1 in. diameter and greater, the company reports. Features cited by the manufacturer are: Accurate stud alignment on the work piece has been simplified by elimination of the side cable loop, and electrical connections have been reduced from three to one. Nelson Stud Welding Div., Gregory Industries, Inc., Lorain, Ohio.

For commercial & industrial heating with

GAS



field

"MG" Draft Controls are recommended by the nation's leading gas companies as

SAFE

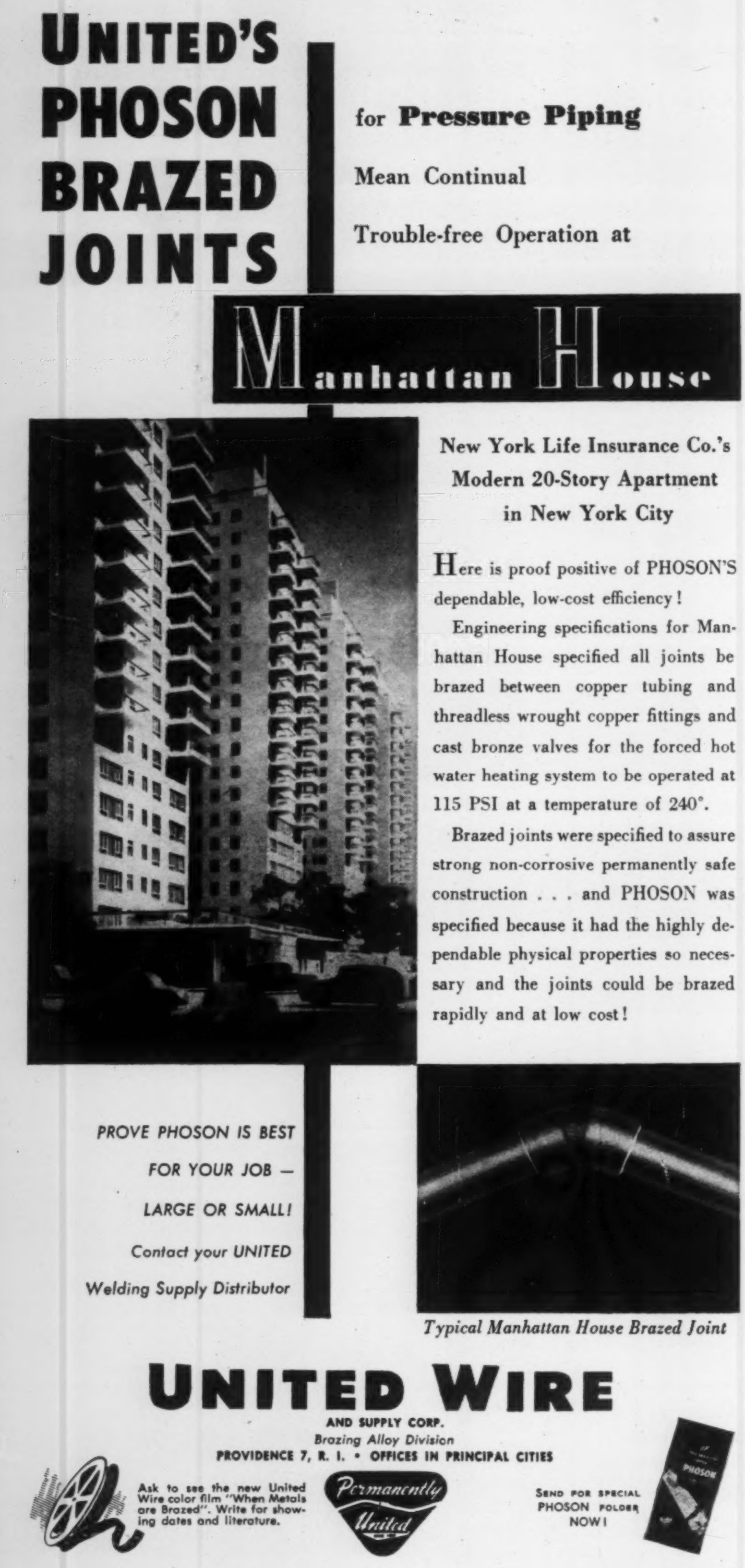
Now you can eliminate heavy fuel wastes with complete safety. With four years of perfect performance behind it the Field "MG" now carries the recommendation of leading gas companies across the country—fully safe, absolutely dependable, highly efficient. But be sure the control you install is a Field. In a gas installation only a perfect control is a good control.

Write for technical information and performance data on the Field "MG" Draft Control.

FIELD CONTROL DIVISION

of H. D. Conkey & Company — Mendota, Illinois

AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists



UNITED'S PHOSON BRAZED JOINTS

for **Pressure Piping**
Mean Continual
Trouble-free Operation at

Manhattan House

New York Life Insurance Co.'s Modern 20-Story Apartment in New York City

Here is proof positive of PHOSON'S dependable, low-cost efficiency!

Engineering specifications for Manhattan House specified all joints be brazed between copper tubing and threadless wrought copper fittings and cast bronze valves for the forced hot water heating system to be operated at 115 PSI at a temperature of 240°.

Brazed joints were specified to assure strong non-corrosive permanently safe construction . . . and PHOSON was specified because it had the highly dependable physical properties so necessary and the joints could be brazed rapidly and at low cost!

PROVE PHOSON IS BEST
FOR YOUR JOB —
LARGE OR SMALL!
Contact your UNITED
Welding Supply Distributor

Typical Manhattan House Brazed Joint

UNITED WIRE
AND SUPPLY CORP.
Brazing Alloy Division
PROVIDENCE 7, R. I. • OFFICES IN PRINCIPAL CITIES

Ask to see the new United Wire color film "When Metals are Brazed". Write for showing dates and literature.

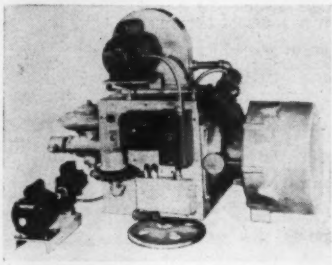
Permanently United

SEND FOR SPECIAL PHOSON FOLDER NOW!

EQUIPMENT DEVELOPMENTS

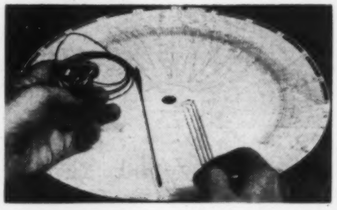
Continued

Packaged Gas-Oil Burner



A packaged, self contained, fan type combination gas-oil burner for firing rates up to 3 million Btu includes blower, burner, oil pump with motor, built-in tuyere, air/gas mixer, safety equipment, transformers, valves, regulators, filter, piping, and wiring. The unit, the "SP890," is designed for use with gas and light oil, oil or gas. A switch control located on the side panel of the burner changes fuel automatically, says the company. Eclipse Fuel Engineering Co., 1002 Buchanan St., Rockford, Ill.

Instrument Recording Pen

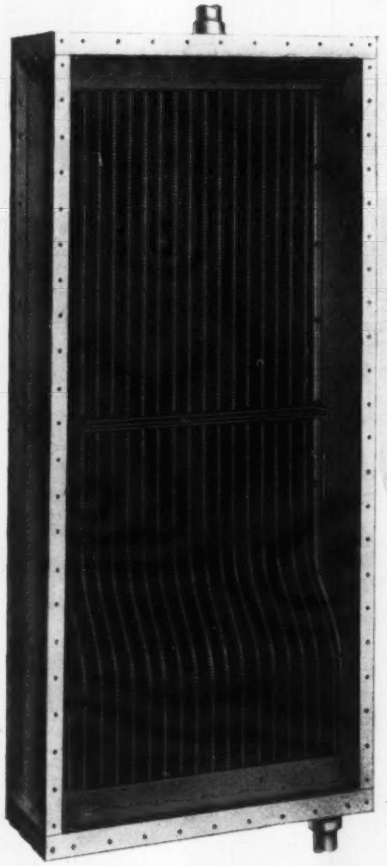


A new instrument recording pen is of stainless steel construction and is fed from a hermetically sealed, plastic ink sac, which contains over a year's supply, its manufacturer reports. Capillary action maintains continuous flow to a precision ground point which traces a quick drying record and practically eliminates "poisoning" of intersecting records, according to the company. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.

Switch for Liquid Meter

A new liquid meter features a built-in, explosionproof electrical switch which is actuated automatically when a desired quantity of liquid has passed through the meter, the

EFFICIENT *Extended-Surface* HEAT EXCHANGERS



for

Heating
Cooling
Process
Air Conditioning

ASK THE AEROFIN MAN

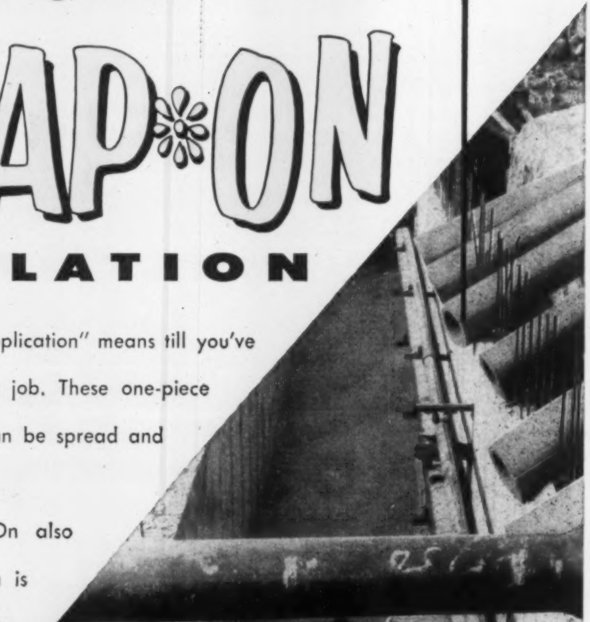
Your Aerofin man's recommendation means high efficiency, long service life, low maintenance costs.

Aerofin's unequalled laboratory and manufacturing facilities — unequalled knowledge of heat-exchange practice — are devoted exclusively to the design and manufacture of highest quality extended heat surface.

Aerofin is sold only by manufacturers of fan-system apparatus. List on request.

AEROFIN CORPORATION
101 Greenway Avenue, Syracuse 1, N. Y.

It floats through the air . . .
. . . and goes on the pipe . . .
with the greatest of ease!



gb SNAP*ON

PIPE INSULATION

You really have no idea what "quick and easy application" means till you've seen G-B Snap*On applied to hot or cold piping on the job. These one-piece molded cylinders of fine glass fibers, in sections 6′ long, can be spread and snapped on the pipe in as little time as it takes to tell.

As the photo at upper left indicates, Snap*On also reduces handling time to an absolute minimum. Snap*On is so light that it can easily be tossed and caught with one hand. If the worker should drop it, no harm is done—for Snap*On is tough and resilient. And as for "clean-up" time, there's nothing to clean up.

Add to these time-saving conveniences the fact that G-B Snap*On delivers maximum thermal efficiency—more heat savings per insulation dollar. Consider, too, that Snap*On is as *permanent* as glass itself. Then write today for the full story on this revolutionary pipe insulation!

WRITE FOR NEW 8-PAGE BROCHURE

GUSTIN-BACON
Manufacturing Company

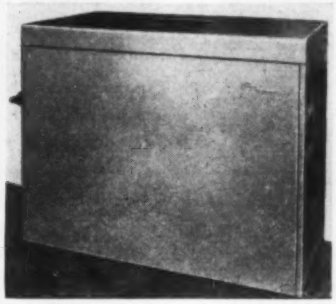
Thermal and acoustical glass fiber insulations • Pipe Couplings and fittings
• Railroad gaskets and supplies

220 W. 10TH ST., KANSAS CITY, MISSOURI

manufacturer reports. The switch can be used to turn pumps on or off, actuate solenoid valves, start agitators, or control other cycling operations by use of suitable relays, etc., says the company. The "Auto-Switch," as it is called, is available on the manufacturer's type "S" meters in sizes from 1 to 4 in. for rates of flow to 500 gpm. Neptune Meter Co., 19 W. 50th St., New York 20.

Air Cooled Chiller

A chiller for use in conjunction with the manufacturer's remote air conditioner is the first air cooled type on the market, the company states.



The unit is supplied factory assembled and charged with refrigerant for easy installation, according to the manufacturer. Units are provided with several low horsepower compressors instead of one compressor of higher horsepower. Brown Products Co., 97-12 Metropolitan Ave., Forest Hills, N. Y.

Expansion Joints for Chilled Water

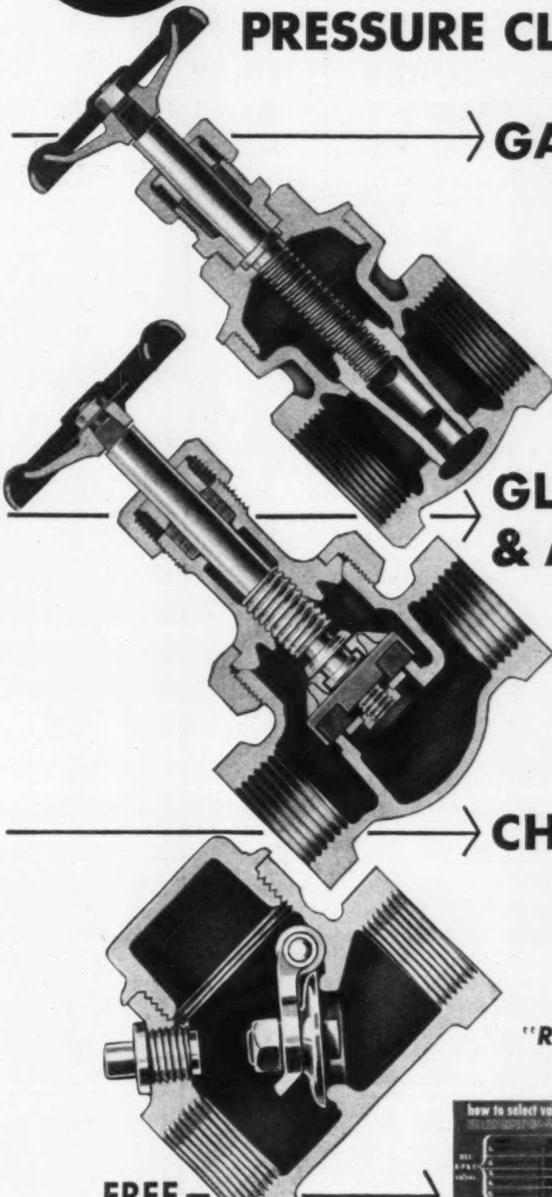
"Sylphon" expansion joints, normally employed to accommodate expansion of steam and hot water risers, are now used in air cooling systems which utilize chilled water, according to their manufacturer. In this application, the joints are designed to take care of both expansion and contraction in a range from 43 to 200 F. Fulton Sylphon Div., Robertshaw-Fulton Controls Co., Knoxville 1.

Electrical Heating Element

A new type of copper clad electrical heating element consists of a seamless sheath of self-annealing copper in which is enclosed a pair of

ACCO products

R-P&C BRONZE VALVES—125, 150, 200 AND 300 LB. PRESSURE CLASSES



GATES

Fig. 86 illustrated, rated for 125 lbs., steam, 200 OWG, has stationary stem, solid wedge, screwed ends. Other 125 lb. models with screwed bonnet, rising stem, solid or split wedge.

GLOBES & ANGLES

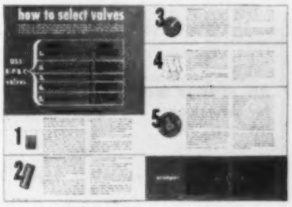
Fig. 1A Globe illustrated, rated 150 lbs. steam, 300 OWG, has renewable asbestos disc, union bonnet. Also furnished as Angle. Sizes ⅛" to 3".

CHECKS

Fig. 198 illustrated, rated for 125 lbs. steam, 200 OWG. Other swing check valves in 150, 200, 300 lb. classes.

"Reliable Protection & Control"

FREE—
WALL CHART
"HOW TO SELECT VALVES"
Write for your copy



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Available in stainless types 304, 304-L, 316, 316-L, 347.

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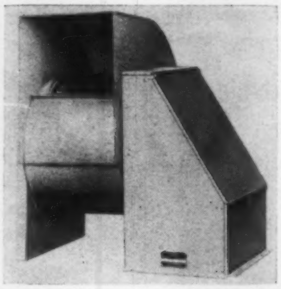
The PYPON Company

FRICK BUILDING PITTSBURGH, PA.

EQUIPMENT DEVELOPMENTS *(Continued)*

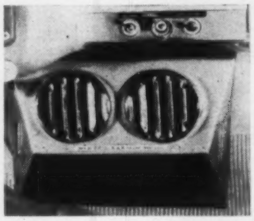
copper resistance wires, insulated by a magnesium oxide, its manufacturer states. Less than ¼ in. in diameter, it can be produced in any length to suit job requirements, the company says. It is designed for controlled temperatures from below freezing to 482 F. Typical applications cited by the manufacturer are heating viscous materials like heavy oils, removing or preventing ice formation on outdoor equipment, preventing freezing of water seals on gas holders and for controlling ice formation in refrigerated rooms. Continental Electric Equipment Co., Box 1055, Cincinnati 1, Ohio.

Blower With Enclosed Drive



A completely "Enclosed Drive" blower in sizes 10 to 36 in. wheel diameter is a self contained unit with pulleys, v belts and motor pre-engineered, the manufacturer announces. Weatherproof covers have been incorporated as a standard feature of blowers geared for outdoor installation. Pre-greased and sealed ball bearings are designed to counteract lubrication neglect and to be impervious to dust, dirt, moisture or excessive temperature changes. Utility Fan Corp., Div. of Utility Appliances Corp., 911 E. 59th St., Los Angeles 1.

Automotive Air Conditioner



"Frigiking" and "Frigikab," automotive air conditioners for passenger cars and trucks, respectively, have under-dashboard housings that contain evaporator, blower fan, thermostat, and air direction louvers, the manufacturer reports. Units deliver up to 365 cu ft of refrigerated air per minute without detracting from engine efficiency or increasing battery strain, according to the company. Frigikar Corp., 1602 Cochran, Dallas.

D-C Braking Controller

A d-c braking controller is available in two sizes of enclosures for braking standard induction motors from ¼ to 25 hp, its manufacturer reports. Operated from a single pushbutton, the controller requires no adjustment after initial installation, the company says. Components of the unit are a selenium rectifier, contactors, transformer, and a timing circuit. Westinghouse Electric Corp., Box 2099, Pittsburgh 30.

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"do
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about
the weather"

STEEL PIPE
SNOW MELTING
and ice removal
SYSTEMS

CONTROL IT WITH STEEL PIPE SNOW MELTING

When Mark Twain said, "Everybody talks about the weather but nobody ever does anything about it," he was reckoning without the ingenuity of modern science. Today we "seed" the clouds to produce rain, dissipate fog chemically and mechanically, produce sunshine electronically, and *melt snow as soon as it touches ground.*

The use of modern snow melting and ice-removal systems is a sound investment in areas where snow and ice are a detriment to the free, safe, sure movement of people and vehicles. Progressive businesses now make their own weather as far as controlling the all-winter accessibility of their properties is concerned. Sidewalks, driveways, ramps, shipping docks, parking areas, garage and service aprons, airplane hangars, crosswalks, even bridge floors and private spurs and tracks, can and are being made "weather-proof."

For these snow and ice removal systems *steel pipe* is the overwhelming choice for commercial, industrial and domestic installations. Why? Because steel pipe has not only been proved in more than 60 years of hot water and steam heating applications, but has also the advantages of economy and adaptability for the panels, coils and runs of modern snow melting systems. Yes, steel pipe is first choice . . . the most widely used pipe in the world for heating, plumbing, snow melting, fire sprinkler systems, and the transmission of power, steam and air.

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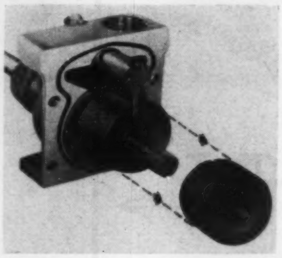
EQUIPMENT DEVELOPMENTS

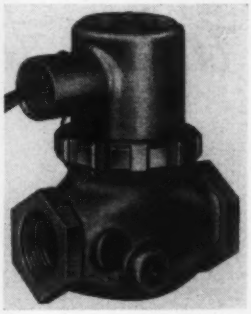
Continued

Rotary Displacement Pump



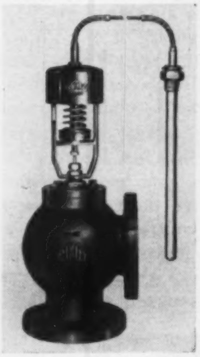
A gearless, rotary type displacement pump has a self lubricating carbon-graphite impeller and is available in capacities from 1 to 10 gpm with pressures to 150 psi, the manufacturer announces. It is recommended by the company for use on water systems and for chemical pumping operations of all types. The pump is designed to run in either direction and to be mounted in any position without affecting performance. Eco Engineering Co., 12 New York Ave., Newark 1.

Solenoid Gas Valve



A new gas valve, designed to be very quiet in operation, is a conventional solenoid type, but with the power element mounted to a synthetic rubber base enclosed in a sound deadening chamber, and featuring a soft seat with compression spring closure, its manufacturer reports. Valves are available in ½, ¾ and 1 in. sizes with capacities of 340, 450 and 775 cfh. White-Rodgers Electric Co., 1209 Cass Ave., St. Louis.

Angle Temperature Regulator



A new line of angle "Type T" temperature regulators may be mounted directly on heat exchangers, instant water heaters, etc., that have inlet connections on top, according to the manufacturer. The regulators have wearing parts of stainless steel or bronze that can be renewed, and an "over-run" feature for protection of the thermal element in the event temperature at the bulb exceeds the range of the regulator, the company reports. Units are available with screwed connections in sizes from ½ to 2 in. and with flanged connections in sizes from 2 to 8 in. O. C. Keckley Co., 400 W. Madison St., Chicago 6.

Room Air Conditioners

Two lines of room air conditioners, designed for flush mounting as one of 23 installed positions, are

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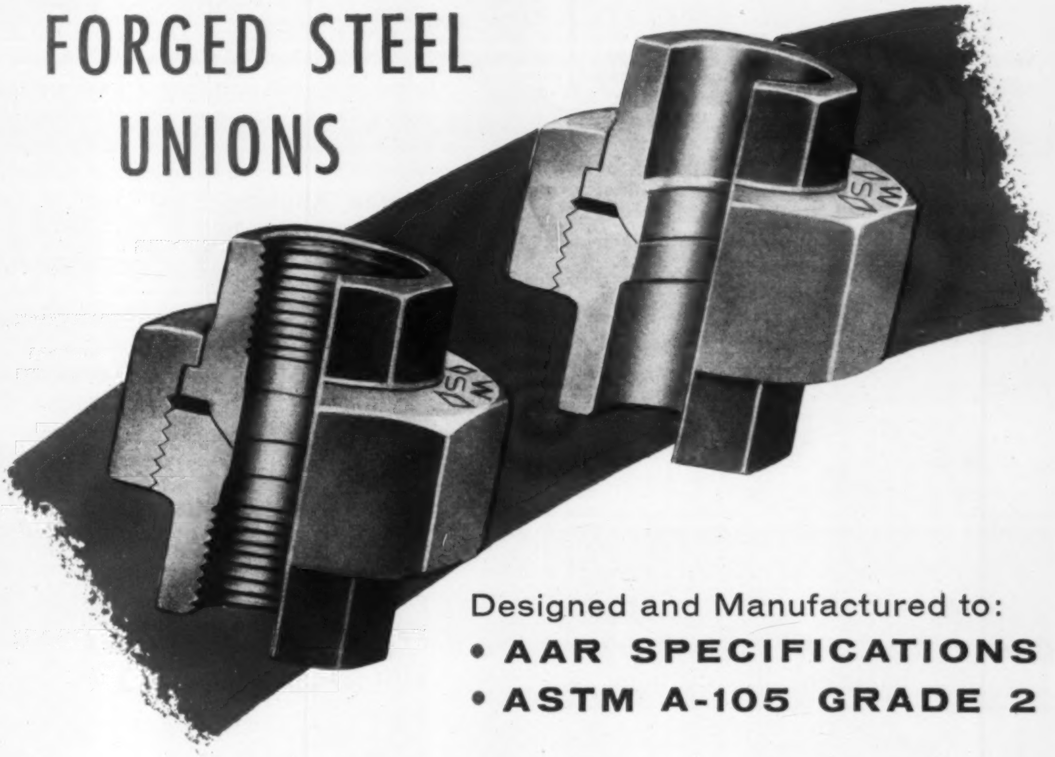
FORGED STEEL UNIONS



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- **ASTM A-105 GRADE 2**

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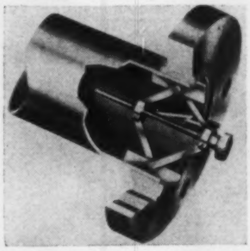
EQUIPMENT DEVELOPMENTS

Continued

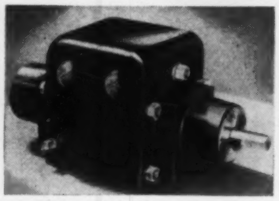
equipped with thermostats to automatically maintain the desired temperature, and are constructed according to the specifications of the new National Electric Code, the manufacturer reports. Units are available in ½, ¾, 1 and 1½ hp sizes. Amana Refrigeration, Inc., Amana, Iowa.

Flange Aligning Tool



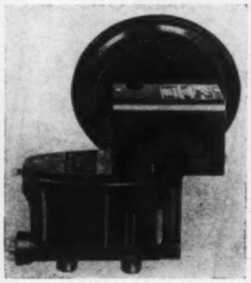
A new self centering flange aligning tool, designed to accommodate any pipe size from 3 to 12 in., is slipped into the pipe and expanded to center itself against the inside diameter, with the stepped shoulder members against the pipe's end face. Projecting shoulders are automatically aligned with the pipe axis and, when the flange is held in position against the projecting shoulders, the flange can be welded in alignment, the manufacturer reports. Contour Marker Corp., 1843½ E. Compton Blvd., Compton 2, Calif.

Acid Handling Pump



A synthetic rubber pump has shaft, eccentrics, and guides of two special alloys; one to permit the handling of boiling hydrochloric, sulphuric and mixed acids, and the other to extend pump service to highly oxidizing acids, free chlorine and bleaching compounds, its manufacturer states. The pump is a positive displacement oscillating rotary type, with capacities up to 10 gpm and pressures to 100 psi at a sustained 1725 rpm, the company reports. Other features cited by the manufacturer are high suction lift, self priming, and steady linear flow. Eco Engineering Co., 12 New York Ave., Newark 1.

Safety Fan Controls for Oil Burners



Two new "Air Prover" safety mechanisms are designed to provide safety fan control for pressurized burners, and may be used with the company's constant level oil control valves. Shown is the model "113A," which may be used manually or thermostatically. It reduces oil flow to a safe rate when air failure occurs, the company states. Air pressure against a diaphragm

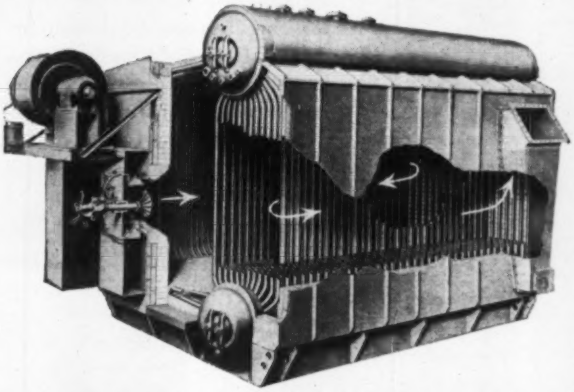
FOR STEAM CAPACITY *up to* 60,000 POUNDS

Choose your boiler from these two

If you burn oil or gas, investigate the VP Package Boiler for capacities up to 40,000 pounds per hr . . . the VU-10 up to 60,000 pounds.

For stoker firing, the VU-10 is available from 10,000 to 60,000 pounds of steam per hour.

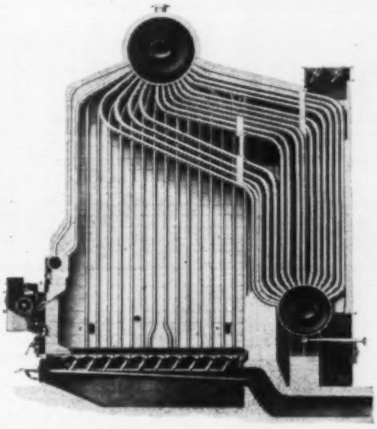
Whatever your fuel . . . whatever your steam capacity requirements up to 60,000 pounds per hour . . . you'll find that one of the Combustion Engineering Boilers described below will be just right for you.



The VP Boiler — the Package Boiler with EXTRA Features

The VP *boiler*

The C-E Package Boiler, type VP . . . completely shop-assembled . . . for oil or gas firing. It is available in capacities from 4,000 to 40,000 lb steam per hr; for pressures to 500 psi. The VP Boiler has more water-cooled area per cubic foot of furnace volume than any other boiler of its size and type. The large (30-in. diameter) lower drum permits a simple, symmetrical tube arrangement . . . greater water storage capacity . . . easy access for washing down or inspection. The centrifugal fan is efficient, yet its noise level is less than half that of typical high-speed blowers used on most package boilers. Baffle arrangement is simple, resulting in low draft loss . . . simple soot blowing . . . elimination of dead pockets . . . high heat absorption.



The VU-10 Boiler, as arranged for C-E Spreader Stoker firing

The VU-10 *boiler*

The VU-10 Boiler is designed for industrial load conditions, particularly for plants with small operating and maintenance forces. Capacities range from 10,000 to 60,000 lb steam per hr . . . pressures to 475 psi . . . heat recovery equipment is available if desired. Fuel can be either coal (C-E Spreader, Traveling Grate or Underfeed Stoker) oil or gas. This boiler is a completely standardized design adaptable to many conditions. It responds readily to variations in load; it is simple to operate and maintain. All parts are easily accessible for inspection. Like the VP, the VU-10 Boiler is a complete unit — boiler, furnace setting, fuel-burning equipment, controls, forced draft — bringing you the benefit of one contract . . . one responsibility.

Fully descriptive catalogs are available on both of these boilers. We'll be happy to send yours upon request.

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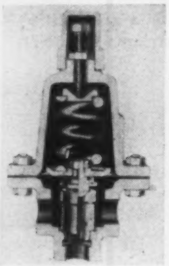
EQUIPMENT DEVELOPMENTS *Continued*

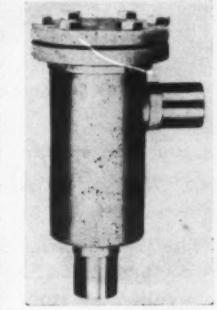
actuates the unit, thus moving a lever arm to allow full oil flow. The other unit, model "114B," is actuated by a thermally responsive bimetal element in the air stream, and automatically reduces oil flow to a predetermined rate, says the manufacturer. A-P Controls Corp., 2450 N. 32nd St., Milwaukee 45.

Back Pressure Relief Valves



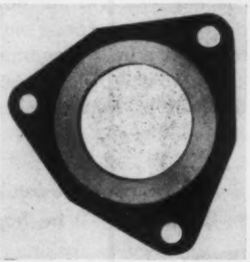
New type "FR" back pressure relief valves are available in pipe sizes from ½ to 2 in. in iron, bronze, stainless steel or monel bodies for pressures to 400 psi, the company reports. The "floating ring" element (a friction reducing factor) is free to move laterally in any direction to find its own alignment with the spherical seat disc. Valves have three connections, two side inlet and one bottom discharge, for installation in straight through fashion or "angle type" with one of the side connections plugged. A. W. Cash Valve Mfg. Corp., 6621 E. Wabash Ave., Decatur, Ill.

Strainers



A line of strainers, designed to protect valves and pumps in fluid systems, are fabricated of ferrous and nonferrous metals for use with specified fluids and are offered in cleanable and noncleanable models, the manufacturer states. Units are built with reinforced monel and stainless steel screens of 60 and 80 mesh, with up to 180 sq in. of screen area. They are available with connection sizes up to ⅝ in. SAE, 3⅝ in. sweat and 1¼ in. FPT with flange, the company reports. Detroit Controls Corp., 5900 Trumball Ave., Detroit 8.

New Gasket Construction

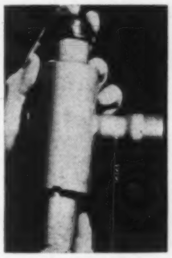


A new development in gasket construction is said to eliminate flow restriction and turbulence in the line, as well as danger of gasket rupture at high temperature due to entrapped air between insert and envelope. The inner periphery of this "French type" gasket is of "channel" construction so designed that it does not extend beyond the inside diameter of the pipe to cause a throttling action, the manufacturer states. Crane Packing Co., 1800 Cuyler Ave., Chicago 13.

EQUIPMENT DEVELOPMENTS

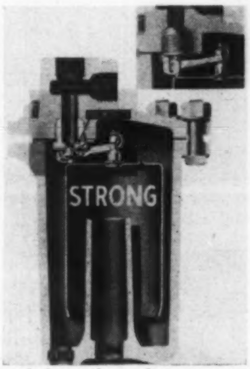
Continued

Crankcase Pressure Valve



A crankcase pressure regulating valve, model "237," is designed to protect compressor motors against overload and burnout caused by high torque loads resulting from excessive suction pressure. At high suction pressure load, the valve protects the motor by pressure regulation of refrigerant gas to the compressor inlet. A safe back pressure is allowed to develop, and by modulating action the valve varies the flow to maintain the pressure limit setting, the company reports. Two models are available — capacities 1½ and 3 tons, "Freon 12." A-P Controls Corp., 2450 N. 32nd St., Milwaukee 45.

Steam Traps



The manufacturer's new "Hydro-Flex" steam trap has a dual fulcrum arrangement and lever lift action. This includes a primary high leverage fulcrum for cracking the valve from its seat and a secondary low leverage fulcrum to open the valve and permit maximum flow, the manufacturer reports. Units are available in semisteel, cast steel and forged steel construction for use on pressures to 2500 psi and temperatures to 1100 F, according to the company. Strong, Carlisle & Hammond Co., 1392 W. 3rd St., Cleveland 13.

Wrought Iron Tubing

Corrosion-resistant, cold drawn, wrought iron tubing, manufactured to precise tolerances for heat transfer apparatus and air conditioning systems, has the following specific applications cited by the manufacturer: Ammonia condensers, heat exchangers, preheaters, gas cooling apparatus, gasoline condensers, evaporators, vaporizers producing butane and propane gas, cooling pipe and steam condensers. A.M. Byers Co., 1810 Clark Bldg., Pittsburgh 22.

Hand and Foot Valves

Design advancements in the manufacturer's "880" series of hand and foot valves have been incorporated in the operating mechanisms of both the three and four way models, the company reports. Valves are available with either single or double foot treadles and vertical or horizontal hand lever controls. A

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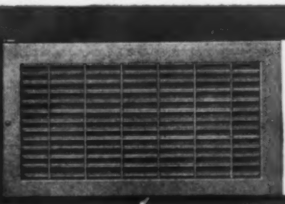
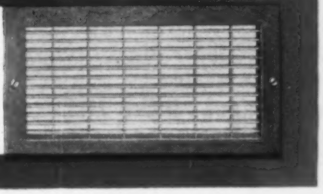
for Commercial Installations



No. 311-D-WG
—grille bars set at approximately 35° down. ←



No. 311 WG
—grille bars set permanently for straight flow. →

1. Vertical or horizontal bars strengthened by interlocking cross bars; no vibration.
2. Tamper-proof. Changes in air distribution cannot be made by unauthorized persons.
3. Mesh (⅜ x 1¹¹⁄₁₆) filters 78% of free area yet darkens the duct and reduces highlights from back of the grille.
4. 14 gauge steel solid bars ½" deep—strong enough to be "kick-proof"—a must for schools.
5. All bars made from round edge stock. No sharp edges. (A must for schools.)
6. The only grille for taking abuse in school gyms and hospital psychopathic wards.
7. Made in several large and small sizes.

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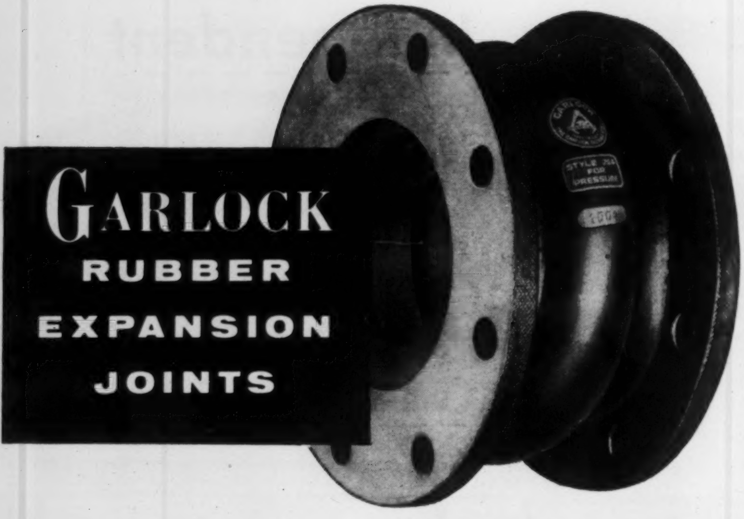

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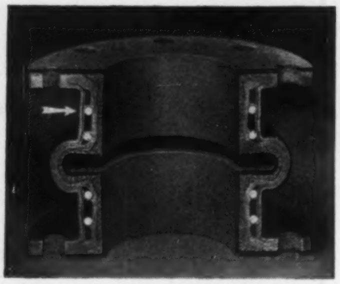
RUBBER
EXPANSION
JOINTS

- ABSORB VIBRATION
- ELIMINATE NOISE
- REDUCE HAMMER BLOW CAUSED BY PRESSURE SURGES
- PREVENT FLANGE BREAKAGE
- CORRECT PIPING MISALIGNMENT

Garlock rubber expansion joints will stand up under repeated flexing. They are constructed of high grade rubber which is combined with plies of sturdy cotton duck and reinforced with steel rings.

These flexible joints are used in air conditioning and water lines in commercial and institutional buildings and industrial plants to prevent transmission of sound and to absorb vibration, thus saving wear and tear on the pipe flanges. They are made for all pipe sizes 3/4" to 72". Write today for Rubber Expansion Joint Folder, AD-137.

Expansion joints in operation on 2½" suction and discharge pipes.



Sectional view shows sturdy construction of single arch joint. Arrow points to one of steel reinforcing rings.

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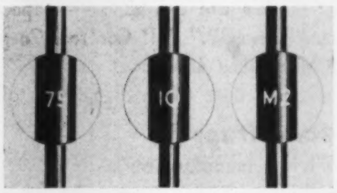
GARLOCK

PACKINGS, GASKETS, OIL SEALS,
MECHANICAL SEALS, RUBBER EXPANSION JOINTS

separate base for bottom or side ports is provided and an optional base is available to permit manifolding a series of bases to each other for simplified piping, the manufacturer states. Pipe sizes include 1/4 and 3/8 in. in the three and four way models. The pressure rating is 125 psig and the maximum recommended operating temperature is 175 F. Ross Operating Valve Co., 120 E. Golden Gate, Detroit 3.

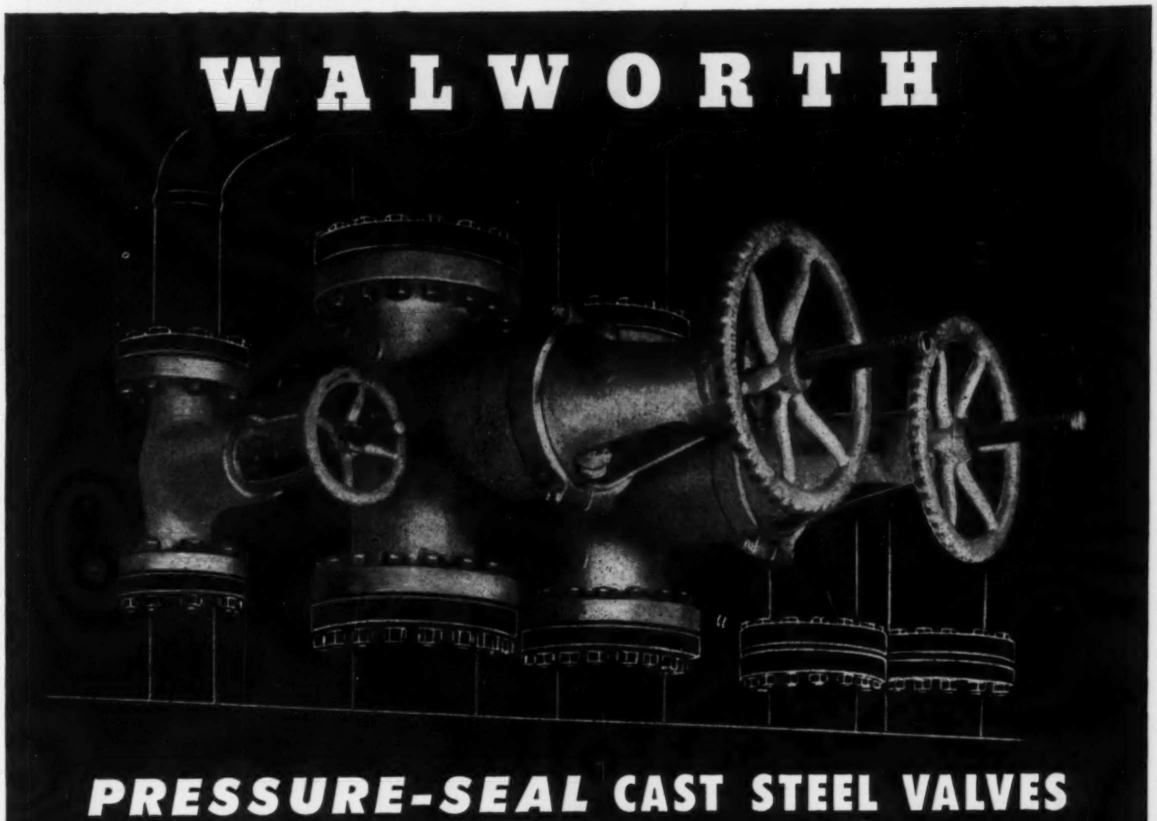
Plastic Pipe Markings



White length markings at 10 ft intervals are on all of the manufacturer's plastic pipe as an added convenience in measuring. Three different markings are used on various types of pipe for purposes of identity. The figure "10" appears on pipe for submersible pump installations, jet well settings, industrial and mine piping, and 100 and 125 lb "PressuRated" pipe. "75" is used as a 10 ft marker on 75 lb "PressuRated" pipe, and the legend "M2" identifies the company's line of standard polyethylene pipe. Yardley Plastics Co., 138 Parsons Ave., Columbus 15.

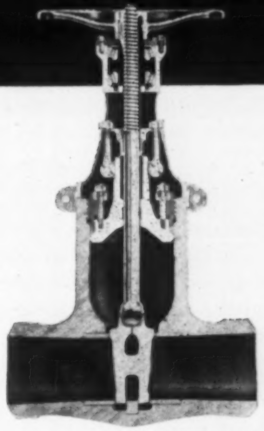
Chemical Pumps

Designated the model "CHS" series, the manufacturer's new 5 and 7½ hp "Chempumps" are engineered for leakproof pumping at heads to 195 ft and capacities to 300 gpm. Pumped fluid is allowed to enter the enclosed rotor chamber, providing automatic lubrication of the bearings, the company reports. Rotor and impeller are an integral unit and the only moving part. Units are available in cast iron, stainless steel, monel or "Carpenter-20." Temperature and pressure limits are 450 F and 150 psi, says the manufacturer. Chempump Corp., 1300 E. Mermaid Lane, Philadelphia 18.



WALWORTH

PRESSURE-SEAL CAST STEEL VALVES



Better because **... They have no bonnet flanges, bonnet bolts, or bonnet welds. Ideal for high-pressure, high-temperature steam service and corresponding boiler feed service, Walworth Pressure-Seal Cast Steel Valves weigh less, and take up less space than the flanged bonnet type of valves used for similar services.**

These are a few of the important advantages made possible by the design of Walworth *Pressure-Seal* Cast Steel Valves. Internal line pressure is utilized within the bonnet to maintain a tight, leakproof, body-to-bonnet connection under all normal operating conditions. The higher the pressure, the tighter the seal.

Ask for your copy of Walworth Circular 143. It gives detailed information, including sizes, dimensions, and specifications for all Walworth Pressure-Seal Cast Steel Valves.

Cross section of 8-inch Series 900 Walworth Pressure-Seal Cast Steel Gate Valve. Pressure-Seal Globe, Check, Angle, and Non-Return Valves are also available in Series 600, 900, 1500 and 2500 in a wide range of sizes.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

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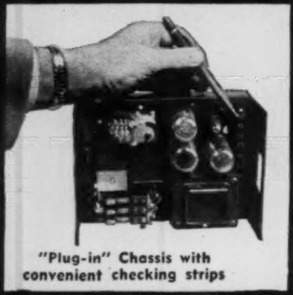
BARBER COLMAN

New Wheelco Combustion Safeguards



"Plug-in" Chassis with convenient checking strips

Simple manual or automatic Flame-otrols

FLAME-OTROL

Give you six new advantages:

1. Compact "plug-in" chassis design for all models.
2. Industrial relays throughout.
3. Snap-action thermal delay switches to eliminate contact arcing.
4. Safety type terminal strip assures positive contact pressure at all times.
5. Standard electronic tubes are used on all models.
6. Handle "rests" to protect chassis when out of cabinet.

These are only a few of the *plus features* you get in the *all new* Wheelco Flame-otrol . . . the first completely modern combustion safeguard for use with any commercial gas or oil fuel . . . the only instrument that gives you true "safe-start" operation, with *automatic delay* for the safe-start circuit!

Manual or *automatic* models now available . . . plus a complete selection of flame detection systems for maximum protection under a variety of combustion conditions. Your Wheelco representative can help you design and install a properly engineered combustion safeguard system, assuring maximum flexibility in selection and use of burners, pilots, and fuels.

Write for Bulletin F-6570 describing the new and improved Wheelco Flame-otrols, today!

Packaged Control Centers

Designed and manufactured to your specifications, prewired Control Centers are a time- and money-saving method of housing instruments, pilot lights, alarms, and other components of a *complete* combustion safeguard system. Wheelco representatives, in all principal cities, will help you plan, specify, and install Control Centers for any commercial or industrial heating job.

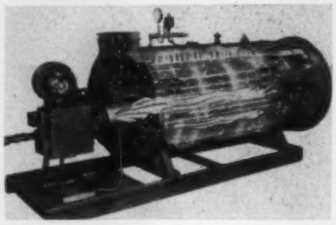
WHEELCO INSTRUMENTS DIVISION

BARBER-COLMAN COMPANY, DEPT. N, 1501 ROCK ST., ROCKFORD, ILLINOIS
BARBER-COLMAN OF CANADA, LTD., DEPT. N, TORONTO, ONTARIO, CANADA

Industrial Instruments • Automatic Controls • Air Distribution Products • Aircraft Controls • Small Motors
Overdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

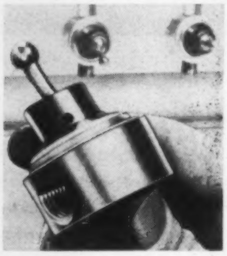
Automatic Boiler

A new 15 hp model has been added to the manufacturer's line of automatic "Steamboilerplants," the company reports. The unit is engineered for burning gas only, oil only, or gas and light oil. Completely assembled, the boiler is ready for operation after electricity, steam, water, fuel and stack are connected, according to the manufacturer. Equipment includes burners, blower, combustion safeguards, and valves and controls. Eclipse Fuel Engineering Co., 1002 Buchanan St., Rockford, Ill.



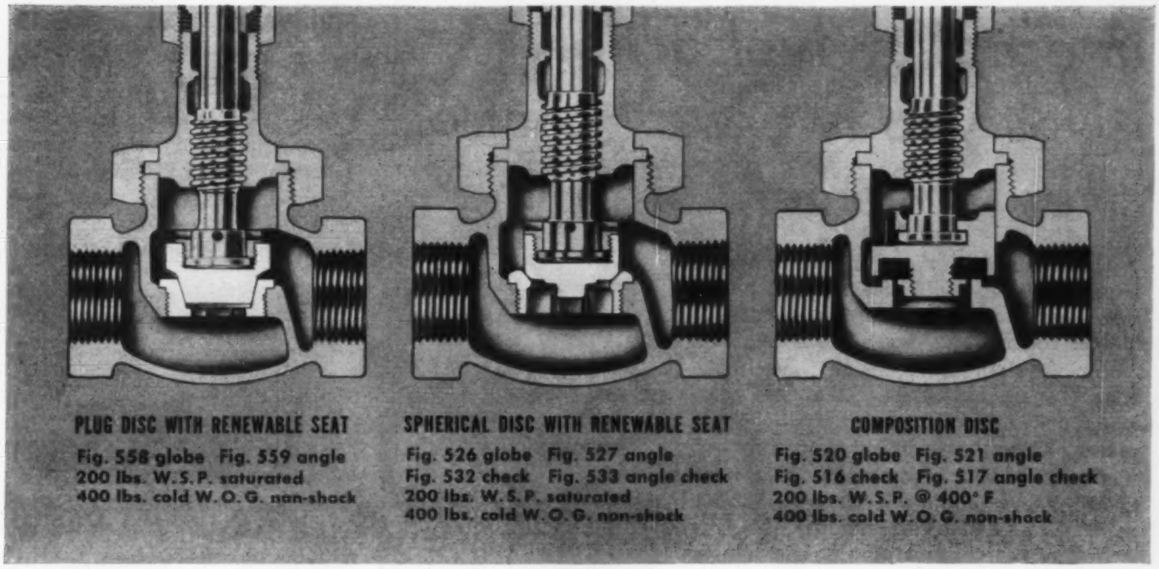
Toggle Actuated Valve

A new toggle actuated valve is available in bronze, aluminum, steel or stainless steel body with a neoprene diaphragm. When the toggle is in the neutral position, the flow is through the valve and the atmospheric vent is shut off. When the toggle is tipped, the inlet to the valve is shut off and the downstream side is vented to the atmosphere. George W. Dahl Co., 430 High St., Bristol, R.I.



Plastic Tubeaxial Blower

A new 14 in. PVC tubeaxial blower, designed for expelling corrosive air, fumes and gases, has the following components, says its manufacturer: The all plastic impeller blade has a spinner cap that is aerodynamically balanced to insure high speed operation with a minimum of vibration. Drive shaft, pulley, belts and



PLUG DISC WITH RENEWABLE SEAT
Fig. 558 globe Fig. 559 angle
200 lbs. W.S.P. saturated
400 lbs. cold W.O.G. non-shock

SPHERICAL DISC WITH RENEWABLE SEAT
Fig. 526 globe Fig. 527 angle
Fig. 532 check Fig. 533 angle check
200 lbs. W.S.P. saturated
400 lbs. cold W.O.G. non-shock

COMPOSITION DISC
Fig. 520 globe Fig. 521 angle
Fig. 516 check Fig. 517 angle check
200 lbs. W.S.P. @ 400° F
400 lbs. cold W.O.G. non-shock

Choose the OIC disc-seat combination of greatest reliability

The modern OIC "500 Line" provides a choice of 3 bronze globe valve designs to meet specific sets of operating conditions.

You can rely on all three. But you will improve over-all globe valve performance by selecting the design which especially fits your particular operating requirements.

Base your selection on these facts

Plug disc with renewable seat—Use this design where throttling is required on services up to 550°F. The tapered (15° angle) disc and its seat are stainless steel, hardened to more than 500 Brinell. They resist erosive and abrasive wear resulting from throttling . . . even crush foreign particles to effect tight closure without damage to seating surfaces. Seat and disc may be reground or replaced.

Spherical disc with renewable seat—Use in general wide-open and closed service, up to 550°F, where frequent cycles of operation will be required. Seat and disc are copper-nickel alloy, resistant to corrosion and galling. Disc and seat mate by line contact assuring positive tight closure on any fluids. Both seat and disc may be reground or replaced.

Composition disc—Normally furnished with 8E disc—suitable for steam, hot water, oil and gas—and designed for use in wide open or closed position. This relatively soft disc material permits the disc to effect tight closure in spite of small scratches or particles on the seat. This valve may be used for a number of services by fitting it with discs suitable for the fluids to be handled. Use of slip-on type disc-holders simplifies disc replacement.

Stems on all "500 Line" valves are machined from special OIC 40-alloy, an aluminum-silicon-bronze which will not gall or seize. The complete "500 Line" includes bronze globe, angle and check valves, with many parts interchangeable.

For choice of design, high quality and maximum performance specify the complete "500 Line" when you order from your OIC Distributor.

Write for Form No. 1001 which describes the "500 Line" more fully.

OIC
FOUNDED 1883

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VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

internal swivel action

gives you two-way control over movement of piping

With the Blaw-Knox functional spring hanger, you can readily control both lateral and longitudinal swing movements of hanger rod up to 7 degrees.

For the hanger is designed with the Blaw-Knox patented *internal swivel action*, which permits movement while the hanger case itself remains vertical. Larger movements are readily accommodated by overhead roller assemblies. Each is a complete packaged unit ready to install.

In fact, our entire line of rigid hanger assemblies, overhead roller assemblies, vibration eliminators, as well as the functional spring hangers and constant support spring hangers are furnished as complete units . . . thereby saving engineering time and eliminating expensive cutting, threading and assembling in the field.

Our engineers, who have had years of experience, are available to both design and make recommendations for your hanger requirements.

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PIPE HANGERS

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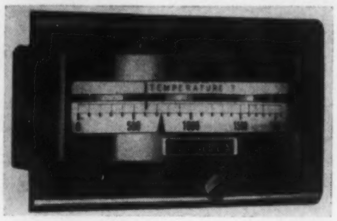
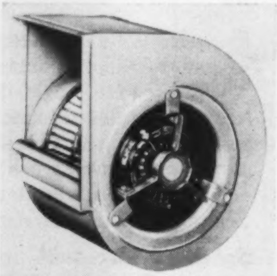
sealed bearings are totally encased. Blowers may be installed vertically or horizontally, the company reports. Industrial Plastic Fabricators, Inc., Norwood, Mass.

Indicating Millivoltmeter



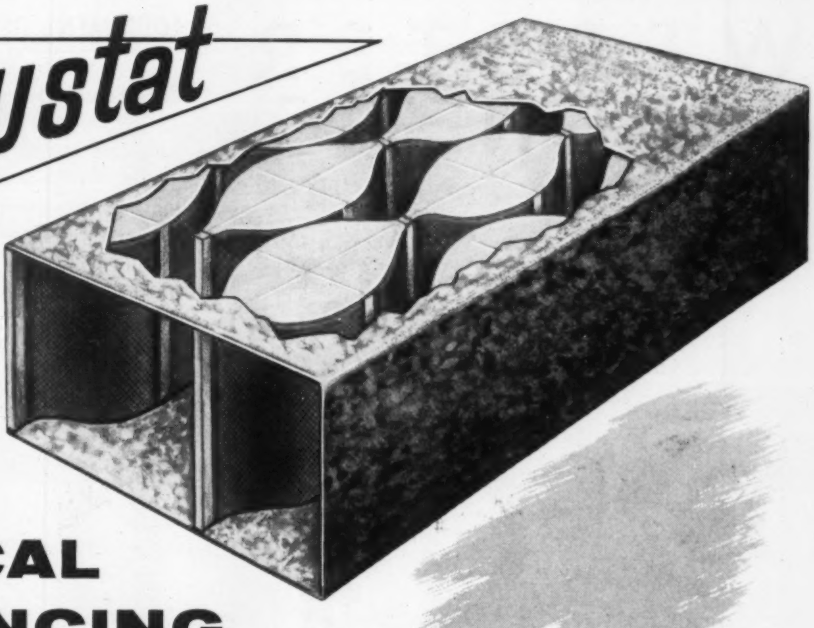
An indicating millivoltmeter, designed for short response time and high accuracy, has a newly developed high torque jeweled millivoltmeter mechanism with an "Alnico V" magnet and self supporting coil, its manufacturer announces. It is equipped with a neutralizing resistance to compensate for changes in coil resistance due to ambient temperature changes, says the company. Uses cited by the manufacturer are as a pyrometer, tachometer, pH indicator, or for power consumption measurements. The Bristol Co., P.O. Box 1790, Waterbury 20, Conn.

Direct Drive Blowers



As a development in direct drive blowers, wheels on the manufacturer's units are fitted with a neoprene hub designed to isolate motor noise and reduce vibration, the company says. This gives practically silent operation, according to the manufacturer. The device is being incorporated into all of the company's direct drive blowers. Utility Fan Corp., Div. of Utility Appliance Corp., 911 E. 59th St., Los Angeles 1.

Aircoustat

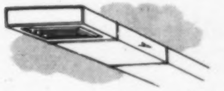


PRACTICAL SILENCING for AIR CONDITIONING SYSTEMS

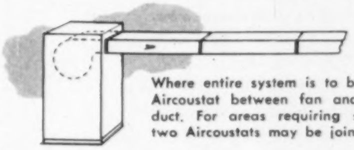
Aircoustat is a compact, *completely packaged* unit for silencing fan and air noise in air conditioning systems. Easily installed directly into the duct work, Aircoustat eliminates the need for costly, extensive duct lining. And results are astonishing: one 7 *foot* unit reduces noise level below what *100 feet* of commercial duct lining could accomplish.

Engineered to provide broad band attenuation with low pressure drop, Aircoustat is available in 14 standard sizes for use with all styles and sizes of duct, and 8 types to meet any desired conditions. Selection is no problem: ***if it fits geometrically, it fits acoustically.***

Where to install Aircoustat

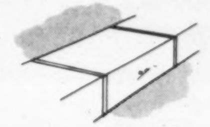


Aircoustats are incorporated as part of the duct work. If only selected areas require quiet, install above individual diffusers.

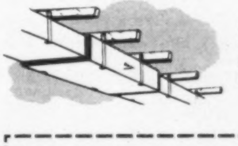


Where entire system is to be silenced, insert Aircoustat between fan and first length of duct. For areas requiring special silencing, two Aircoustats may be joined in series.

How to install Aircoustat



Aircoustat requires no special tools for installing. It is constructed to be joined to ductwork with a lock seam.



If ductwork and Aircoustat differ in size, a canvas or asbestos coupling may be used. If ductwork is hung, support Aircoustat similarly.

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SILENCE SERVICE

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INDUSTRIAL SOUND CONTROL, INC.
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Please send me more information on AIRCOUSTAT.

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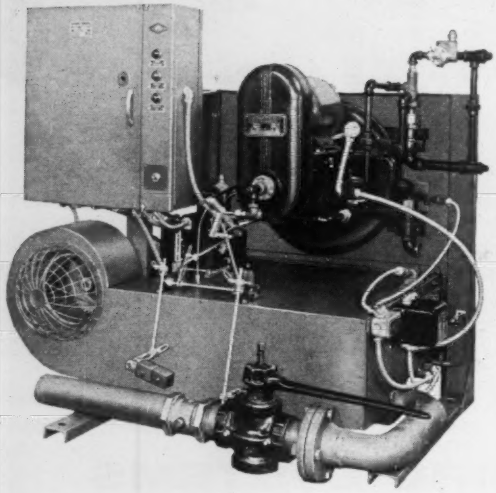
WEBSTER
ROTONETIC*



DUAL FUEL FIRING
BURNER

- √ **Sizes from 75 to 300 horsepower.**
- √ **Minimum gas pressure requirements.**
- √ **Low installation costs.**
- √ **Maximum efficiencies on BOTH gas and oil.**
- √ **Minimum base height requirements.**
- √ **Utilizes all grades of fuel oil.**
- √ **Extremely low noise level.**
- √ **Approved electronic combustion safeguard system.**
- √ **Simpler changeover than ever before.**
- √ **One hundred per cent forced draft.**
- √ **Completely assembled, piped, wired and tested.**

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

Listed by Underwriters' Laboratories, Inc.

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The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

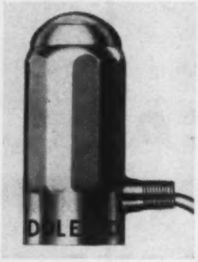
EQUIPMENT DEVELOPMENTS

Continued

Hydraulic Hose, Couplings

"Surgepruf," a new line of hydraulic hose and couplings engineered for medium high and high pressure service, features a "double wedge" grip which, the manufacturer states, makes possible assembly on rubber covered hose without skiving. A special slotted bushing facilitates retightening the coupling on the hose without disassembly if it comes loose through vibration or flexing, the company says. Joy Mfg. Co., Oliver Bldg., Pittsburgh 22.

Air Valve



A new air valve, engineered to be fast venting, has a fixed orifice and is nonadjustable. It is for use on gas, oil and stoker fired systems when rapid air elimination is desired at low steam temperatures, the manufacturer states. Called the "1D," the valve is designed to cut off instantly and provide fuel savings, according to the company. Dole Valve Co., 1933 Carroll Ave., Chicago 12.

Plastic Air Filters

"Dust magnet" filter, designed to last the life of the air conditioner in which it is installed, is of woven plastic that can be cleaned quickly and put back into service immediately, according to the manufacturer. The new line includes five models with improved dust pickup capacities, the company says. Stoddard Industries, Inc., 1545 Kingsbury St., Chicago 22.

Equipment Briefs . . .

TAPERED REAMER, a tool for machinists and maintenance men, is designed to enlarge undersized holes from 1/8 to 3/8 in. diameter. The reamer is available with handle attached, without handle, or with interchangeable handles, the manufacturer states. Vaco Products Co., 317 E. Ontario St., Chicago 11.

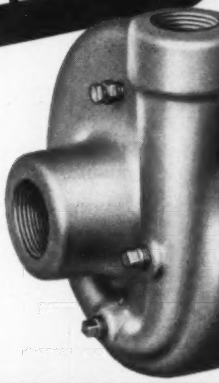
"THE SPACE ARM" is an adjustable boom for raising and holding in place pipes, conduits, fixtures, sheet metal duct, etc., up to 25 lb. that are to be secured to the overhead, its manufacturer reports. On each end of the boom are clamping devices that can be attached to or released from articles by remote control. Lamp Snatchers Co., 3013 N. Clark St., Chicago 14.

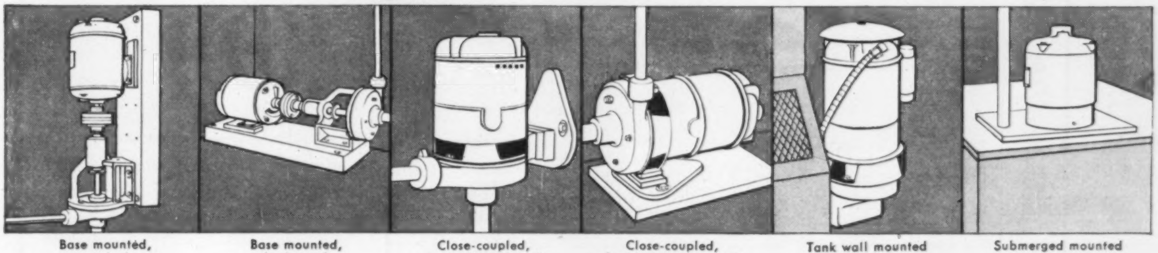
INSULATING GLASS setting blocks and spacer strips, made of neoprene, are designed to afford a positive 1/8 in. clearance between the sash framing members and the face of the glass to simplify installation of "Thermopane." Use of this material provides a cushion for the glass, the company says. Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo.

ALLIS-CHALMERS
Air Conditioning
PUMPS

One Pump

...6 Mounting Methods





Base mounted, vertical

Base mounted, horizontal

Close-coupled, vertically mounted

Close-coupled, horizontally mounted

Tank wall mounted

Submerged mounted

makes easier installation for you

YOU CAN SOLVE MANY DIFFICULT INSTALLATION problems by using Allis-Chalmers air conditioning pumps. You can get a single set of operating characteristics using four different models that can be installed in any of six different ways. You can choose the mounting method easiest for your job without having to figure a different pump each time.

Engineering Assistance

Your Allis-Chalmers representative or distributor is an experienced, highly qualified specialist who will give you full cooperation every step of the way. He'll help you pre-engineer the setup. Many times he can make valuable suggestions which will result in a simpler, more effective installation.

Delivery from Convenient Stock

Allis-Chalmers air conditioning pumps in a wide range of types and sizes are carried in stock by Regional Warehouses and Authorized Distributors throughout the country. A-4577

Electrifugal is an Allis-Chalmers trademark.

ALLIS-CHALMERS
For AIR CONDITIONING

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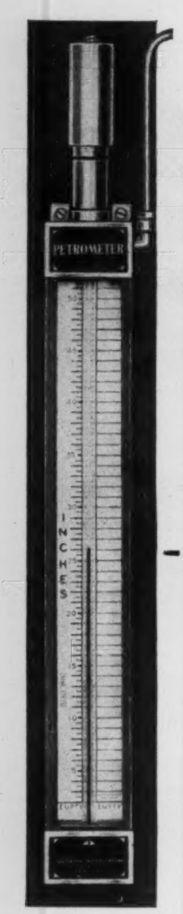
FHP Package Pumps get Bulletin 52B7529 . . .
Electrifugal Pumps, Bulletin 52B6140 . . .
Supporting Adaptor Pumps, Bulletin 52B6083
. . . Vertical Mounted Pumps, Bulletin 52B6975.
Write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS



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"Bring Your Liquid Level to Eye Level"

THE BEST GAUGE FOR:

Commercial and Industrial Fuel Oil Storage Tanks

Domestic Installations with Buried Tanks

Storage Tanks for other Industrial Liquids—gasoline, solvents, acids, etc.

HERE'S WHY:

Can be installed on tanks above or below the ground and up to ¼ of a mile away.

No troublesome moving parts—operates on the principle of the U-tube. Simple, dependable and accurate.

Large, easy-to-read vertical scale gives tank contents at a glance. Scales are easily changed for different liquids.

Easy to install—the tank assembly for the gauge can be installed when the tank is empty or when containing liquid. It can also be installed separately to complete the tank work. The gauge can be connected any time later. Only one simple connection to tighten.

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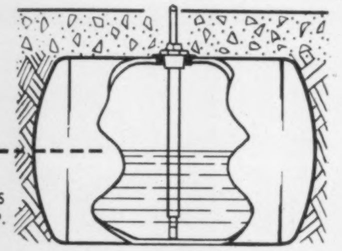


FOR TANKS 20 INCHES TO 50 FEET DEEP.

LIQUIDEPTH INDICATORS, INC.
43-22 TENTH STREET
LONG ISLAND CITY 1, N. Y.

RECENT TRADE LITERATURE...

▶ *ALLOYS AND FLUXES*—A pocket sized, how-to-do-it folder on welding, brazing, soldering, and cutting steel with alloys and fluxes gives operator instructions on 14 of the manufacturer's alloys and their companion fluxes for application to various kinds of steel by torch and arc. All-State Welding Alloys Co., Inc., 249-55 Ferris Ave., White Plains, N.Y.

▶ *ALUMINUM*—*Alcoa Aluminum in Architecture*, a recently published booklet by the company, stresses the uses for aluminum in the architectural field. Illustrations and details of piping and sheet aluminum are included. Aluminum Co. of America, 754 Alcoa Bldg., Pittsburgh 19.

▶ *BOILERS*—The complete 1955 line of hot water boilers, available in sizes ranging from 130,000 to 3,451,000 Btu for oil, gas and gas/oil combination fuel, is covered in the manufacturer's new catalog. Sid E. Parker Boiler Mfg. Co., Inc., 2035 E. 37th St., Los Angeles 58.

▶ *BOILERS*—A revised edition of the manufacturer's 32 page general catalog is indexed to readily provide reference data on high and low pressure boilers for commercial, industrial and residential use. Also included are descriptions and illustrations of the company's water heating products, both direct fired and storage types as well as indirect water heating coils. Kewanee-Ross Corp., Kewanee, Ill.

▶ *BOILERS*—Commercial steel boilers with induced draft fans are pictured and described in new 8 page catalog No. 675. Drawings of the fans and their component parts, charts detailing mounting dimensions and space requirements, and wiring diagrams showing operation of the fans are included. The National Radiator Co., Johnstown, Pa.

▶ *DISPLACEMENT INDICATOR*—A leaflet gives features, applications, and specifications for the manufacturer's model "300" displacement indicator for differential transformer transducers. Daytronic Corp., 216 W. Main St., Dayton, Ohio

▶ *DRIERS, FILTERS, STAINERS*—Latest information, part numbers, dimensions and capacities of the company's line of "DFN" driers, filters, strainers, charging lines, water bubblers, water regulating valves, vibration absorbers, and hose for pull-out compartments are given in the manufacturer's new 12 page catalog. The McIntire Co., Okner Pkwy., P.O. Box 5, Livingston 11, N.J.

Why you can do it better with Bethcon

Bethcon galvanized sheets are the result of Bethlehem's search for a better zinc coated sheet than is possible with the ordinary hot-dip process. The Bethcon coating is applied by continuous galvanizing. Based on years of research, Bethcon sheets are a great advance over ordinary galvanized sheets, and solve many problems for sheet metal users.

TIGHTER—the Bethcon coating is more adherent and holds tighter to the steel. This means the coated sheet will take severe drawing or forming without flaking or peeling.

MORE UNIFORM—the zinc is distributed evenly over the entire Bethcon sheet. The center, the edges and the ends of each sheet get equal coating, equal protection. The heavy zinc bead usually found on the drip end of an ordinary galvanized sheet is eliminated.

BETTER LOOKING—the spangles on Bethcon sheets are bright, uniform and attractive in appearance.

You can get Bethcon sheets either in cut lengths or coiled strip, 16-gage or lighter. Either plain carbon steel or Beth-Cu-Loy (copper-bearing) steel can be used for the base metal, depending on your requirements. For further information, please get in touch with the nearest Bethlehem office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

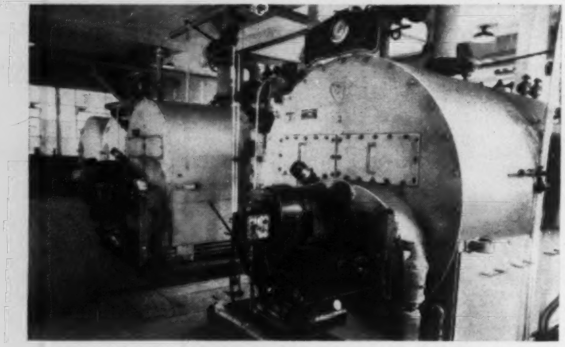
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM
STEEL

BETHCON CONTINUOUSLY GALVANIZED STEEL SHEETS

How 2 Dutton EconoTHERMS

CAN CUT YEARLY STEAM COSTS



OFF-CENTER FIRING • ROTARY COMBUSTION
GAS OR OIL FIRED • AUTOMATIC OPERATION
NO COSTLY CHIMNEY OR FOUNDATION
ONE "PACKAGE"—FACTORY PRE-TESTED

DO YOUR DAILY and seasonal steam loads vary widely? Many owners find that *two or more* Dutton EconoTherm Boilers give big advantages over a single larger unit — especially in *lower total steam costs!*

WITH TWO OR MORE EconoTherms, you can meet varying steam demands fast — and at *peak fuel efficiency.* Yet you save fuel each day and all year by operating just *one* unit during warmer weather, "off hours", nights, week-ends and holidays.

MULTIPLE UNITS give *extra* protection from plant shutdowns . . . and as your plant grows, it's easy to add another "packaged" EconoTherm. Because steam costs depend mostly on fuel and labor costs, *every EconoTherm feature* is designed to keep costs low!

CALL YOUR DUTTON REPRESENTATIVE — he'll carefully analyze your particular needs and offer cost-cutting suggestions.

CHECK FIRST with

WRITE FOR DUTTON ECONOTHERM BULLETIN EC-52G

Dutton BOILERS

Division Hapman-Dutton Company
KALAMAZOO, MICHIGAN
Boiler Builders Since 1880
Four Types — Sizes from 5 to 300 H.P.

RECENT TRADE LITERATURE

Continued

▶ *EXPANSION JOINTS*—The company's line of expansion joints is illustrated and described in its new 4 page folder. The low pressure and high pressure series and joints for special applications are presented. Joseph Kopperman & Sons., 310 New St., Philadelphia 6.

▶ *FANS*—Manufacturer's bulletins 544 and 545 contain data, specifications and illustrations for classes II and III heavy duty industrial fans and a line of general purpose fans that are portable, self contained units of medium capacities for ventilating and industrial applications. The New York Blower Co., 32nd St. and Shields Ave., Chicago 16.

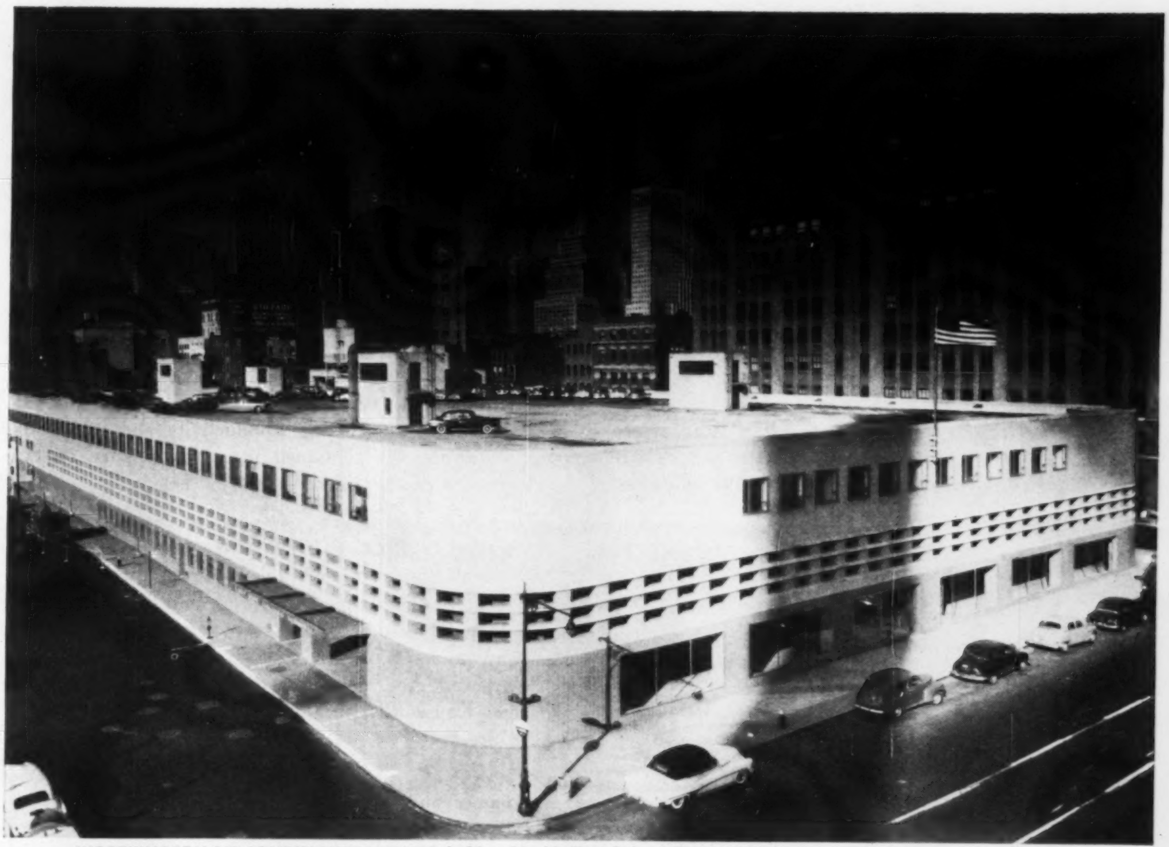
▶ *FILTERS*—The company's complete line of "oil wetted" and "oil bath" breather filters, designed for installation on crankcases of engines and compressors, gear cases, hydraulic equipment, liquid storage tanks, machinery housings and other equipment, are illustrated and described in a new folder. Air-Maze Corp., 25000 Miles Rd., Cleveland 28.

▶ *FORCED HOT WATER HEATING*—A complete line of equipment for forced hot water heating systems and chilled water cooling systems is described in the manufacturer's new 24 page bulletin, GK-954. Nine pages of information on circulating pumps and their applications are given. Bell & Gossett Co., 8200 N. Austin Ave., Morton Grove, Ill.

▶ *FURNACE AND BOILER CLEANERS*—Illustrations and specifications for the manufacturer's vacuum furnace and boiler cleaners are presented in a new 12 page catalog. Units feature a flameproof, disposable paper bag, the company reports. Empire Chemical Products Co., 10 Longworth St., Newark 2.

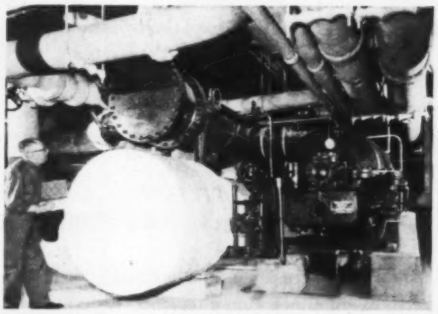
▶ *GAS FIRED HEATERS*—Manufacturer's bulletin PBI-54 pictures and describes his "Panelbloc" gas fired heaters, designed to generate infrared rays that "heat like the sun." Heaters use natural, manufactured or bottled gas, and need no electrical connections, the company says. Thermobloc Div., Prat- Daniel Corp., South Norwalk, Conn.

▶ *HUMIDITY CONDITIONING FOR MARINE SERVICE*—Bulletin K-254 discusses the application of the manufacturer's humidity conditioning equipment for marine service. Included are the requirements for dry cargo conditioning as set by the USMA for C-4 Mariner Class ships and ship operators. Operation of the units is schematically illustrated. Kathabar Div., Surface Combustion Corp., Toledo 1.



WORTHINGTON AIR CONDITIONING SYSTEM in New York's East Side airline terminal . . .

. . . cools 12,000 airline passengers a day



CHILLED WATER to air condition new airline terminal is supplied by this efficient Worthington centrifugal refrigeration unit.

Passengers stay cool and comfortable in New York City's new East Side Airline Terminal while waiting for their trip to the airports.

A joint enterprise serving 21 U. S. and foreign flag airlines, the new terminal accommodates over 12,000 people a day.

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Worthington air conditioning equipment has been the choice of leaders in business and industry for over 50 years. For the reasons why, write Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.5.36.HP, Harrison, New Jersey.

A.5.36

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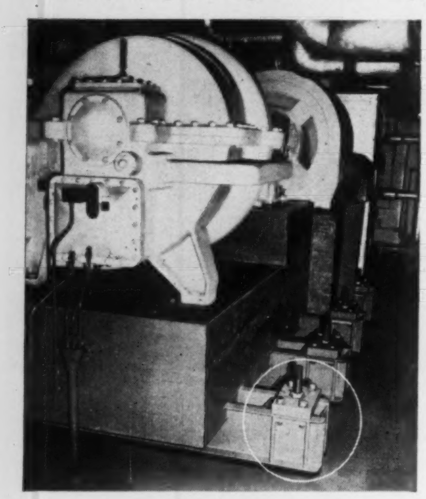
A feature of the Cafritz Building in Washington, D. C., makes it possible to drive your car up a series of ramps, and park it outside your office door.



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RECENT TRADE LITERATURE

Continued

▶ *INDUSTRIAL RUBBER PRODUCTS*—A new 58 page general catalog on the manufacturer's industrial rubber products is illustrated and is divided into sections for quick reference to a particular product or group of products. There are sections on belting, hose, packing, and moulded rubber products. Performance data, specifications, and sizes are included in all sections. Quaker Rubber Corp., Div. of H. K. Porter Co., Inc., Tacony and Comly Sts., Philadelphia 24.

▶ *INSULATION*—Description and illustrations of various types of "Fiberglass Aerocor" insulation designed for low thermal conductivity and high sound absorption are contained in a new 8 page bulletin. Owens-Corning Fiberglas Corp., Toledo 1.

▶ *MALLEABLE COUPLINGS*—A new 16 page illustrated folder on malleable pipe couplings and fittings includes photographs, diagrams, and specifications for the manufacturer's "Rolagrip" couplings for plain end pipe and "Gruvagrip" and "Gruvajoint" couplings for grooved pipe. Gustin-Bacon Mfg. Co., 210 W. 10th St., Kansas City 6, Mo.

▶ *MOTOR SERVICE STATIONS*—A listing of names and addresses of service stations, representatives and factory distributors for the manufacturer's 1/3 to 150 hp industrial motors is presented in the form of a 4 page brochure. Lima Electric Motor Co., 12 Findlay Rd., Lima, Ohio.

▶ *OIL FIRED UNIT HEATERS*—A new catalog, showing the various applications to which oil unit heaters may be applied, explains what an oil fired unit is, how it works, when it should be used, selection of the right heater, heated area coverage, venting and construction details, etc. Delta Heating Corp., Dept. UHC, Trenton 8.

▶ *PLASTIC VALVE, FITTINGS*—An illustrated 4 page circular describes the "Luncor" PVC valve and fittings, designed to have resistance to corrosive chemical action and resist most chemicals used in industry. The Lunkenheimer Co., Box 360, Cincinnati 14.

▶ *PRECIPITATORS*—A 28 page electrical precipitation bulletin describes the general principles of electrical precipitation. Individual sections are devoted to various applications. Installation photographs and diagrams supplement the text. Research-Cottrell, Inc., Bound Brook, N. J.

▶ *PUMP DESIGN*—A 12 page paper, detailing the design and development of centrifugal pumps that

BOOKS

of reprinted material from Heating, Piping & Air Conditioning. You'll get same day shipment — postage paid — when you send check with book orders to Keeney Publ. Co., 6 N. Michigan, Chicago 2, Ill.

★ ★ ★

INDUSTRIAL AIR CONDITIONING HANDBOOK

Information on the purpose, cost, design, operation and maintenance of both process and comfort air conditioning systems in manufacturing plants of many kinds. The combined knowledge and experiences of 33 prominent engineers, every one a designer or in direct charge of the largest factory air conditioning systems in operation. This shows other engineers how air conditioning helps speed production, improve products, increase worker efficiency and operate systems economically. 186 pages, $1.50

INDUSTRIAL VENTILATION HANDBOOK

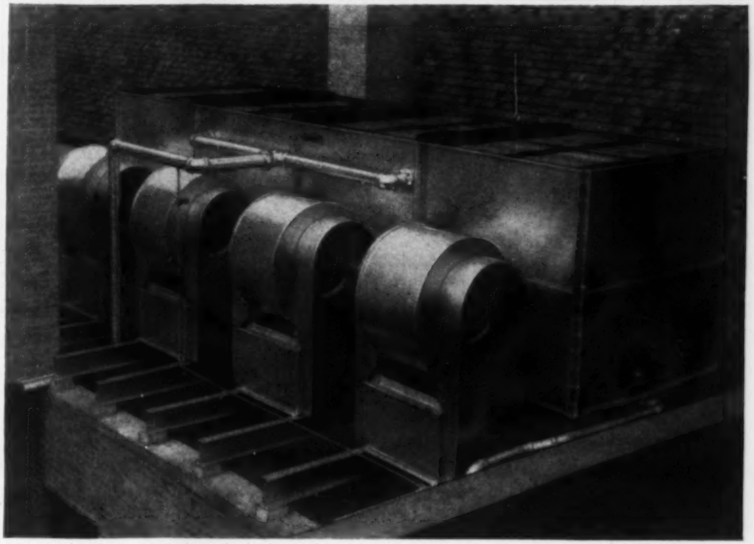
A practical manual on fume removal, dust collecting, ventilating and exhaust systems for industrial plants. Tells how to design correctly and provide for various ventilation requirements . . . make measurements and analyses of fumes, mists and dusts . . . plan exhaust systems, etc. Twenty eminent authorities contributed also to detailed descriptions of systems in actual operation in many plants.
134 pages, $1.50

SNOW MELTING MANUAL

Complete information on correct design, installation and operation of snow melting systems is offered in this reprint of articles originally published in "Heating, Piping and Air Conditioning." Design data based on a study of—and others' actual experience with—over 100 snow melting systems of all kinds. Applications illustrated, for loading platforms and docks; sidewalks; roads; driveways; marquees; parking areas; runways; railway switches, etc. 20 pages, $1.00

★ ★ ★

COOLING TOWER NEWS



This Binks Series 3-B forced draft cooling tower provides more than ample cooling for the 160 tons of air conditioning needed for this university chapel...and does it extremely quietly.

Quietness and compactness win contract for Binks Cooling Tower

Leading Southern University picks Series 3-B Tower for chapel roof.

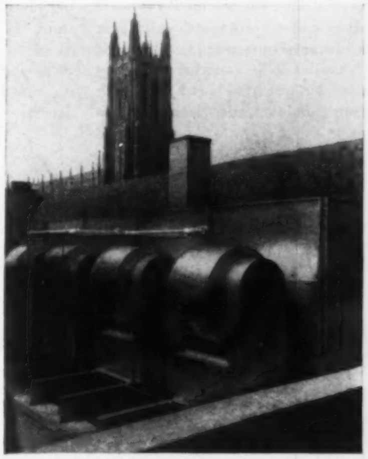
These modern forced draft, low silhouette, cooling towers featuring the dry blower air propulsion system, are designed for use where high cooling efficiency is demanded, combined with whisper-quiet performance and compactness. Squirrel cage blowers supply ample air movement at tip speeds far less than the usual noisy propeller-type fans.

High cooling efficiency is obtained due to thorough water break-up from Binks patented Rotojet nozzles, combined with internal redwood nailless decking. They also feature countercurrent operation with air movement in opposite direction to downward water flow.

Heavily galvanized, these towers reduce maintenance to a minimum. Interior surfaces are fully sprayed with a tough mastic coating. The air propulsion assembly is located in the dry air stream to protect it from corrosion.

Series 3-B towers are completely shop fabricated, ready for easy assembly.

FOR FULL INFORMATION write for Bulletin 477 containing selection tables, dimension data and general specifications for all Series 3-B Towers.



The compact design and low silhouette of this tower keeps it out of sight from street level.

BINKS MANUFACTURING CO. 3118-38 Carroll Ave., Chicago 12, Ill.

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Set it...forget it
for 10 YEARS

Now Jenn-Air Low Contour Exhauster Motors are Lubricated for 10 Years of Service

Once a Jenn-Air Exhauster is set in a wall or on a roof, you can forget maintenance, because the motor is lubricated for 10 years of normal service. Since the bearing is the heart of any motor, you know this vital part is adequately protected in a Jenn-Air Exhauster. This is another feature by Jenn-Air, which has been FIRST with spun aluminum, rust-proof construction, no painting necessary; FIRST with simplicity of installation and ease of cleaning. Exclusive dual low-contour design means beauty that blends with today's modern architecture. It means fitting ventilation needs to the building which adds up to savings in labor and maintenance. Consult Jenn-Air Ventilating Specialists on ventilating problems.

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RECENT TRADE LITERATURE

have no seals or stuffing boxes, covers history, early experimental work and outlines the basic problem of building an electric motor inside a pump. Included are detailed data and curves regarding temperature, pressure and the effects of the design on motor operation. Chempump Corp., 1300 E. Mermaid Lane, Philadelphia 18.

▶ *ROOF VENTILATORS*—A 4 page bulletin contains features, dimensions, performance data on the company's line of motorized roof ventilators. These units have "Hi-Stat" venturi, all aluminum construction, low streamlined silhouette, a vibrationproof mounting, and a sturdy roof base, according to the manufacturer. Uno Ventilator Co., 1236 Eastern Ave., Malden, Mass.

▶ *SELF CONTAINED AIR CONDITIONERS*—Complete technical data and specifications on self contained air conditioning units in capacities ranging from 10 to 30 tons are given in the manufacturer's catalog No. RE-154. Specifications include mechanical details and a set of dimensional drawings. The Alton Mfg. Co., Refrigeration Dept., 112 Ross Ave., Dallas 2.

▶ *STAINLESS STEEL VALVES, FITTINGS*—A new booklet, *Stainless Steel Valves and Fittings in The Pulp and Paper Industry*, discusses applications, processes, methods of installation and maintenance and includes diagrammatic illustrations and tables on mechanical properties, physical properties and corrosion resistance. The Cooper Alloy Foundry Co., Hillside, N.J.

▶ *SPUR GEAR HOISTS*—An 8 page bulletin describing the company's line of spur gear hoists includes pictures and specifications of the "YC" and "YCT" lines, a total of 62 different sizes and models with capacities ranging from 1/4 to 25 tons. Coffing Hoist Co., Danville, Ill.

▶ *STAINLESS TUBING*—TB 365, a 6 page folder on a line of seamless or welded stainless mechanical tubing defines finishes, size ranges, types, and shapes of stainless tubing and contains a table of condensed properties and processing data for nine grades of stainless tubular products. Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa.

▶ *STATIC PRESSURE PROBE*—A leaflet gives information on the manufacturer's model "SSP-1" sphere-static pressure probe. The instrument is designed to permit accurate measurement of static pressure in fluctuating flow. Flow Corp., 283 Concord Ave., Cambridge, Mass.

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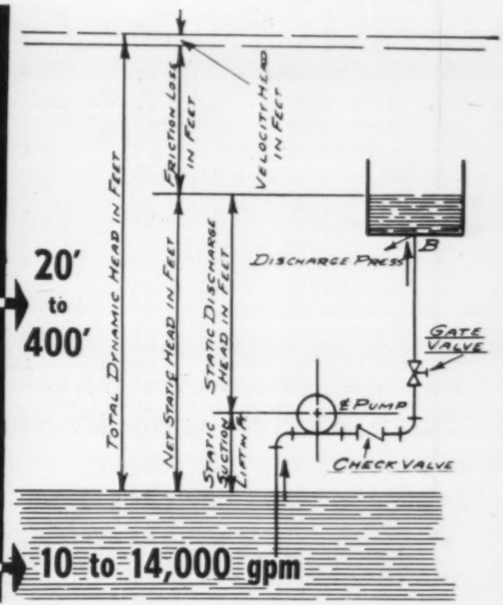
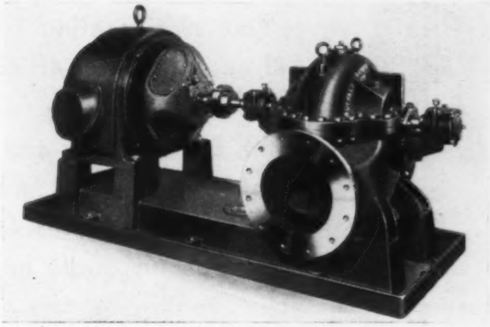


THERE'S A "BUFFALO" DOUBLE SUCTION PUMP FOR HIGHEST EFFICIENCY



"Buffalo" Type "SL" Double Suction Pump. Write for Bulletin 955-P for all details.

If you wish to move large volumes of clear water at heads up to 400', this Type SL Double Suction Pump is your ideal choice. It offers you:

(1) The finest construction, embodying the best accepted pump engineering features—the famous "Q" Factor*.

(2) Such a wide range of sizes (1½" to 20" pumps) that you can very accurately select the most efficient pump from its performance curve.

In addition to these pumps, "Buffalo" builds single suction, single stage and multistage centrifugal pumps for every type of service. We shall be happy to supply you with details on any of these lines—all backed by 78 years of quality pump manufacturing.

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**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

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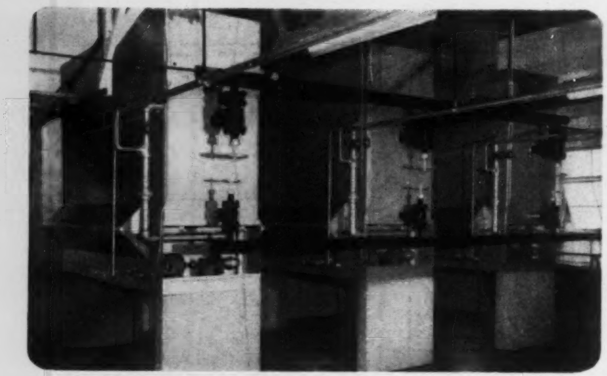

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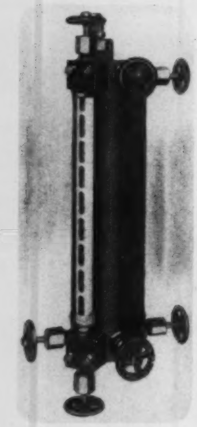

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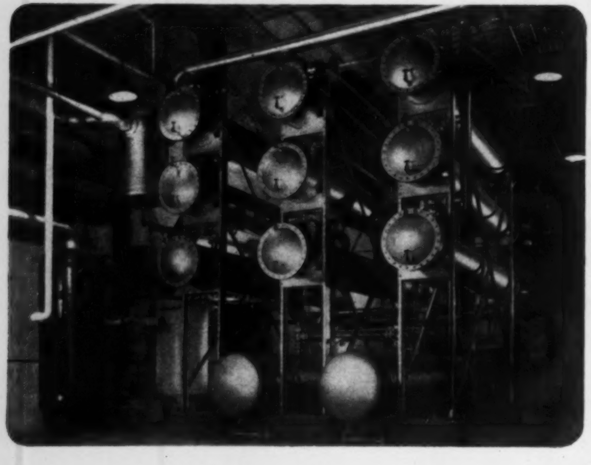

RECENT TRADE LITERATURE

Continued

▶ *TIME DELAY RELAYS*—Bulletin PB-310 describes the company's line of time delay relays and covers models for panel mounting as well as fixed and adjustable units for built in applications. Load circuit operation tables, time ranges, dimensional drawings and other pertinent information are also included. The R. W. Cramer Co., Inc., Centerbrook, Conn.

▶ *VALVES*—Describing "Aloyco" corrosion-resistant valves, a new 8 page bulletin incorporates performance data on the alloy from which they are made for various concentrations of sulphuric acid at different temperatures. It also includes a description and applications, together with engineering specifications and illustrations of 39 valves and fittings. Alloy Steel Products Co., Inc., E. Elizabeth Ave., Linden, N.J.

▶ *VALVES, CONTROL DEVICES*—Four new bulletins by the manufacturer contain information as follows: Pamphlet FN 54-A44, poppet type relief valves. Pamphlet No. 1, data concerning the correct size relief valve for specific jobs. Catalog DE-55, control devices for heating and plumbing systems. F 135, pressure reducing valves and strainers. Watts Regulator Co., 10 Embankment St., Lawrence, Mass.

▶ *VALVES, STEAM AND AIR TRAPS*—Two new bulletins discussing the manufacturer's pressure reducing, temperature regulating, combined pressure and temperature regulating, boiler feedwater controller, pump governor, and pilot valves and steam and air traps are available from the company. The C. E. Squires Co., 18502 Syracuse Ave., Cleveland 10.

▶ *WARM AIR HEATERS*—A brochure of engineering case studies describes eight metalworking applications where warm air space heaters were used to temper large volumes of outdoor make-up air for plant ventilation. Each study discusses an individual company's ventilation problem, and tells how oil or gas fired space heaters facilitated the venting of toxic and noxious fumes, odors and dust. Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22.

▶ *WELDING PROFITS*—*More Profits From Welding*, a folder for job and contract welders, presents the company's line of "EutecRods" and "EutecTrodes," designed for "quality bonds at lower cost." Eutectic Welding Alloys Corp., 40-40 172nd St., Flushing, N.Y.

▶ *WRENCHLESS CHUCK*—A new adaptation of the old pipe wrench gripping principle is the feature of the manufacturer's new power grip wrenchless chuck, the company says. Data and illustrations are presented in a two color folder. Beaver Pipe Tools, Inc., Warren, Ohio.

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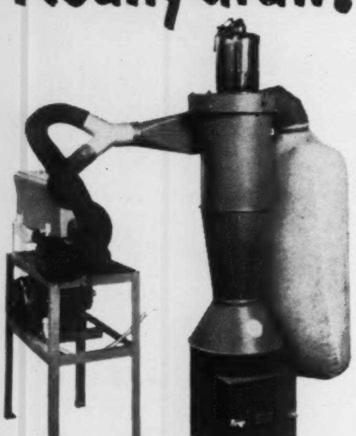

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WHO'S WHAT . . .

(New personnel, promotions)

▶ *FITZGIBBONS BOILER CO., INC.*—Maxwell F. May, vice president and general sales manager. Mr. May has served as Chicago district sales representative since 1948.

▶ *AMERICAN FURNACE CO.*—Clarence S. Franke, chairman of the board; Charles H. Franke, president; Ernst H. Spellmeyer, executive vice president; Richard A. Cromwell, vice president in charge of the St. Louis sales area; Harry J. Timmerman, vice president in charge of purchasing; Dale M. Dassler, a director. Clarence Franke is former president of the company.

▶ *INGERSOLL PRODUCTS DIV. of BORG-WARNER CORP.*—M. R. McLary, works manager of the division located in Chicago.

▶ *REFLECTAL CORP., BORG-WARNER* subsidiary—R. B. Crean, president. Mr. Crean also is vice president and assistant general manager of the Ingersoll Products, Ingersoll Kalamazoo and Ingersoll Conditioned Air divisions of Borg-Warner.

▶ *TUBULAR PRODUCTS DIV., THE BABCOCK & WILCOX CO.*—Sidney O. Evans, manager of tubing operations at the division's Beaver Falls, Pa. plant.

▶ *BRUNNER MFG. CO.*—Paul A. Hunker, sales manager of refrigeration; Wallace C. Roberts, advertising and sales promotion manager.

▶ *BEAVER PIPE TOOLS, INC.*—Charles T. Everett, president and general manager. Mr. Everett also serves as a director of the firm.

▶ *CARRIER CORP.*—George F. Robinson, assistant sales manager for residential air conditioning. He will assist William A. Lake.

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● CAPACITY
● SPACE

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Write today for free 140-page Catalog 101. Furnas Electric Company, 1041 McKee Street, Batavia, Illinois.

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the most practical air conditioning ever built!

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Another of America's great hotels, The Drake in Chicago, has chosen International's Remote Type chilled and hot water units. This is in keeping with their policy of "Nothing but the finest"
Ingenuity and skillful planning, by Refrigeration Systems, Inc. (the contractor), together with the compact design and low noise level of International's Ceiling Hideaway Units paid off with an economical installation that enabled them to have the finest equipment available, at less cost than average equipment. Each room boasts individually controlled units, yet no expensive duct-work was necessary. Due to International's sensible design, units were installed in closet ceilings utilizing otherwise wasted space and International's twin aluminum blowers keep noise level below that of the average fan (less than 25 decibels). Inquire NOW about how you can have the finest in hotel Air Conditioning . . . at less cost per room.

CEILING HIDEAWAY MODEL C. H. W. 90 is the model utilized by The Drake Hotel. Installation cost was far below average.

Console Hideaway Units also available in all standard sizes.

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WHO'S WHAT

Continued

▶ *REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOCIATON*—Elected officers for 1955: A. M. Palen, president; Dudley M. Cawthon, vice president; Ernest W. Farr, Jr., second vice president; William J. Schemers, recording secretary; Harvey W. Hottel, treasurer; B. C. McCall, sergeant-at-arms. Ray Kromer was reelected as the executive vice president and general manager of the organization.

▶ *BONNEY FORGE & TOOL WORKS*—Spencer H. Mieras and Kenneth W. Foust, directors. In addition, Mr. Mieras was elected to the post of executive vice president.

▶ *CONOFLOW CORP.*—Ralph G. Holben, vice president in charge of manufacturing. Formerly plant manager, Mr. Holben will be responsible for the supervision of production, purchasing and maintenance of plant facilities.

▶ *AIRTEMP DIV., CHRYSLER CORP.*—C. J. Katte, manager of industrial relations; R. W. Wyckoff, chief engineer; R. L. Brugler, assistant chief engineer in charge of design operations; R. W. Kelto, assistant chief engineer in charge of laboratory operations.

▶ *D. J. MURRAY MFG. CO.*—S. D. Payzer, vice president in charge of engineering. Mr. Payzer has been with the company since 1923.

▶ *ROBERTSHAW-FULTON CONTROLS CO.*—Carl Seguin, process engineer in charge of cost reduction.

▶ *JOSEPH T. RYERSON & SON, INC.*—Weaver E. Falberg, general manager of sales; John A. Houston, assistant to Mr. Falberg.

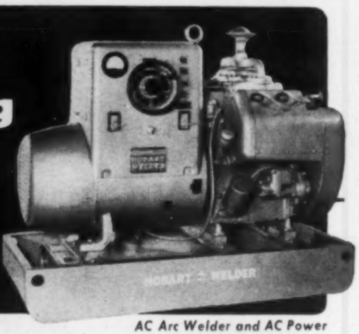
▶ *TRANE CO.*—Harry F. Griese, refrigeration sales department.

▶ *UTILITY FAN CORP.*—Vance Smith, manager of all operations. Mr. Smith was formerly assistant manager.

▶ *LOCKWOOD GREENE ENGINEERS, INC.*—Samuel B. Lincoln, chairman of the board; William J. Heiser, president and treasurer; H. Morgan Rogers, Jr., vice president.

▶ *WORTHINGTON CORP.*—Hobart C. Ramsey, chairman of the board; Edwin Schwanhausser, president; Walther H. Feldmann, executive vice president succeeding Mr. Schwanhausser; William A. Meiter,

200 amp.
A. C. Welding
plus
POWER
for tools, lights, etc.

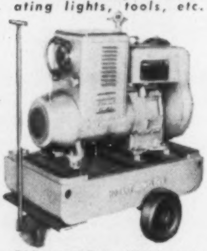


AC Arc Welder and AC Power Unit for welding and operating lights, tools, etc.

To speed up the job and cut costs, plumbers and metalsmiths are using low cost Hobart Arc Welding wherever they can.

A popular model with the plumbing and heating contractors is the combination AC Arc Welder and AC Power Unit. This two purpose machine supplies 200 amperes for welding or 5 KW AC Power for operating tools and lights where electric power is not available.

No matter what your requirements are, Hobart has a welder that is right for your work. Compact, lightweight welders for easy loading in truck or trailer or AC Transformer type welders for shop work. Check and return the coupon today for complete details.



200-amp DC Arc Welder with air-cooled engine.

AC Transformer Type Welder for general shop use.

HOBART TROY OHIO **WELDERS**

Tear off and MAIL TODAY!

● **HOBART BROTHERS CO.,** Box 525, Troy, Ohio, U. S. A. Telephone 21223
Without obligation, please send information on items checked.
☐ AC Welder-AC Power Unit ☐ 200-amp DC Gas Drive
☐ AC Transformer Welder ☐ Electrode samples for______
NAME______POSITION______
FIRM______
ADDRESS______

NEW HOPE
in the battle against
CANCER

THE FIGHT against man's cruelest enemy is far from won. If present rates continue, 23 million living Americans will die of cancer—230,000 *this year*. And thousands of these will die needlessly—through cancer that could have been cured if treated in time.

ALL THE SAME, there have been victories. Thousands who once would have died are being saved—thanks, in part, to *your* donations to the American Cancer Society.

AND, LAST YEAR, the Society was able to allocate $5,000,000 of your donations to research aimed at finding the ultimate cure for *all* cancer. That's more money than ever before.

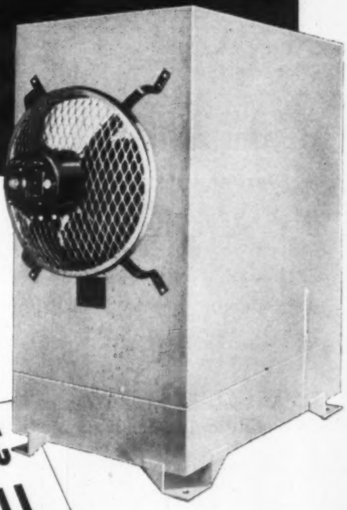
MUCH MORE, of course, remains to be done. So please make *this* year's gift a really *generous* one!

Cancer
MAN'S CRUELEST ENEMY
Strike back—Give
AMERICAN CANCER SOCIETY

COOLING TOWER

by

KRAMER



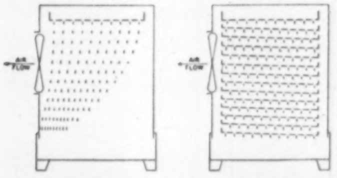
3 to 8 Ton

SCIENTIFIC NEW FILL

MORE CAPACITY
The redistributing decks keep the water uniformly suspended, providing maximum contact between air and water.

LONG LIFE
Casing and sump are heavy gauge steel, hot dipped galvanized after fabrication. Redistributing decks are metal and fireproof.

EASY INSTALLATION
Unit is shipped assembled but can be knocked down to eliminate rigging costs. One fitting required for drain and over-flow.



Conventional Fill Kramer Fill

Write for
Catalog R-225

KRAMER TRENTON CO.
Trenton 5, N.J.

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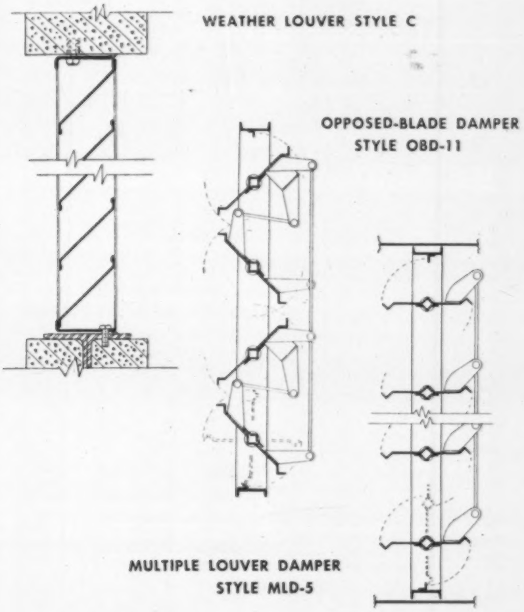
3 POPULAR AIR-PATH PRODUCTS:



WEATHER LOUVER STYLE C

OPPOSED-BLADE DAMPER
STYLE OBD-11

MULTIPLE LOUVER DAMPER
STYLE MLD-5

Sheet metal specialties manufactured by Air-Path: multiple louver, opposed-blade, fire, back-draft, fan, and counterbalanced dampers, stationary louvers, door grilles, access doors, special dampers and louvers.

FOR COMPLETE INFORMATION WRITE FOR CATALOG AP-55

air-path PRODUCTS CO.

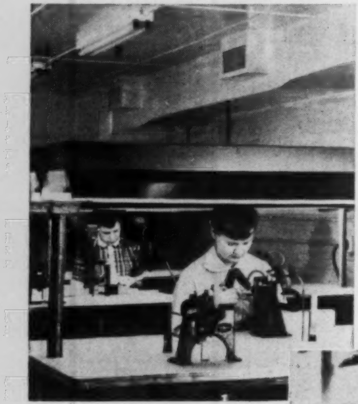
4620 DOLL AVENUE
BALTIMORE 15, MARYLAND
division of Lloyd E. Mitchell, Inc.

You can have **DRY AIR** with exact moisture control..

FOR YOUR COMFORT

FOR YOUR PROCESS

FOR TESTING MACHINES OR MATERIALS AT ANY TIME OF THE YEAR



Assembling Electronic Parts

Packaging Food Products

Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

WHO'S WHAT

Continued

general sales manager; Fred J. Blacker, manager of original equipment sales for the Air Conditioning and Refrigeration Div. Mr. Ramsey succeeds Howard Bruce, who has been elected chairman of the executive committee. Mr. Meiter replaces Thomas J. Kehane, appointed to vice president in charge of sales. Clarence E. Searle is retiring as vice chairman of the board, but will continue as a director.

▶ *PLUMBING AND RADIATOR HEATING DIV. of AMERICAN RADIATOR & STANDARD SANITARY CORP.*— W. F. Hastie and L. A. Kelly, assistants to the vice president of sales. Lincoln Pierce, general sales manager.

IN THE TERRITORIES . . .

(Recent sales appointments)

▶ *SWARTWOUT CO.*—A. Ray Wagner, Southwest district resident sales and service engineer; Howard L. Joseph, Southern California district manager for the company's power plant equipment and "Autronic" process controls divisions.

▶ *SERVEL, INC.*—Walter R. Dwyer, eastern regional air conditioning manager, with headquarters in New York.

▶ *SPORLAN VALVE CO.*—R. E. Niedermeier, manager of new Kansas City office, which serves Montana, Wyoming, Colorado, New Mexico, Kansas, Nebraska and parts of Missouri and Iowa; Frank C. Hawko, field sales representative working out of the company's Mt. Vernon, N.Y. office.

▶ *THERMAL AGENCY*—Charles A. Myers, manager of the national manufacturers' sales firm for atmospheric towers, nozzles, regulators, and other heating and air conditioning equipment.

▶ *GENERAL FITTINGS CO.*—John J. Cotter, representative covering Maine, New Hampshire, Boston, Worcester and upper Massachusetts, replacing Frank E. Johnson, retired.

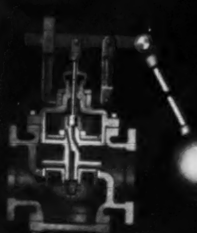
▶ *GRAVER WATER CONDITIONING CO.*—James J. Hanratty, manager of newly opened Houston district office to serve New Mexico and most of Texas.

▶ *KAISER ALUMINUM & CHEMICAL SALES, INC.*—Fullerton Metals Co., Miami distributor for the industrial line of aluminum mill products.

If it's...

MᶜALEAR equipped

it's under SAFE control



One of the many McAlear Controls—No. 395 Pilot Operated Piston Float Valve particularly adapted for use in regulating the flow of water . . . especially applicable for power plants, waterworks, and the general industrial field. This is one of several types of Float Valves in McAlear's line of dependable controls.

● There's one thing you can be sure of in McAlear Controls and that's dependability . . . for infinite care and engineering exactness guard every step of McAlear manufacturing. And before a McAlear control is shipped for sale or use it is job tested for performance. That's why we say—"If it's McAlear Equipped it's under SAFE control." Write for descriptive literature today.

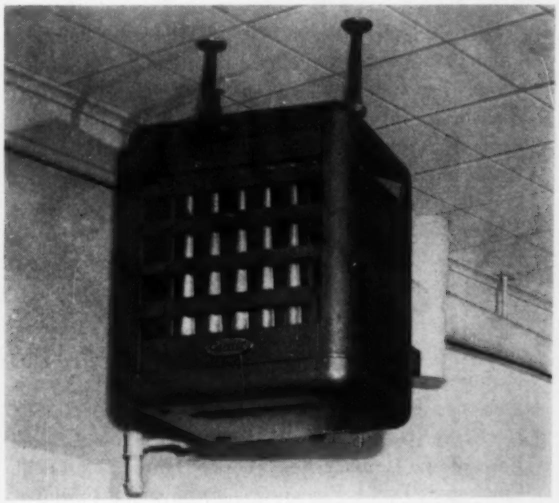
FOR EVERY CONTROL NEED
REMEMBER McALEAR

McALEAR
PRESSURE · FLOW · LIQUID LEVEL · TEMPERATURE
controls
for STEAM. WATER. AIR. OIL-GAS

McALEAR MANUFACTURING COMPANY
1901-1919 South Western Avenue
Chicago 8, Illinois

Carrier knows heating

Over fifty years of leadership in air conditioning have given Carrier unmatched experience in the control of temperature—heating as well as cooling. Yes, Carrier knows heating by experience—and all this engineering skill and leadership contributes to the superiority of Carrier Unit Heaters.



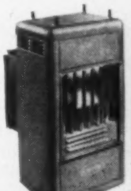
CARRIER GAS-FIRED UNIT HEATERS

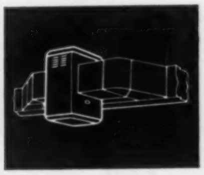
begin with the outstanding midget-size Model 46T50/70, shown above. Only 23 inches high and relatively light in weight, this propeller-fan type unit heater packs a hefty 50,000 to 70,000 Btu/hr. input (according to fan-motor size). It is designed for use when both space and heating requirements are important.

And for extra-long life, only the Carrier line embodies the major advantage of 16-gauge ALUMINIZED STEEL heat exchanger. It lasts far longer than one of ordinary furnace steel of heavier gauge. The dozen or more other Carrier features are equally impressive. Six additional sizes.

Get the complete story about the full Carrier gas-fired line . . . propeller-fan and duct models ranging up to 230,000 Btu capacity. WRITE or USE COUPON for a copy of the 12-page folder on Carrier Gas-fired Unit Heaters.

Duct-type unit heaters embody all the major structural and control features of the fan-propelled model—minus fan. By-pass duct application shown here permits year-round air conditioning through the Carrier Weathermaker System. Available in seven sizes.





Carrier

air conditioning
refrigeration
industrial heating

CARRIER CORPORATION, 305 S. Geddes St., Syracuse, N. Y.
Please send me the 12-page folder on Carrier Gas-fired Unit Heaters.
Name ________________
Firm Name ________________
Address ________________

WHO'S WHAT

Continued

▶ *INDUSTRIAL DIV., MINNEAPOLIS-HONEYWELL REGULATOR CO.*—42 new sales appointees and their territories are: William N. Wallace, Stig G. Gavelin and Richard P. Ash, San Francisco; Jack Phillips and John M. Robinson, Los Angeles; Joseph H. Mitchell, John M. Kennedy and Ronald L. Anderson, Houston; Henry R. Rivitz, William E. Ware and Henry T. Vaders, Philadelphia.

Further appointments are: Walter W. Johnson, Columbus; Frank A. Patterson, James R. Alexander, Owen N. Smith and Kingsley G. Drake, Montreal; Reuben E. Hopkins, Peoria; William D. Robertson, Louis H. Johnson and Joseph T. England, Union; Raymond S. Johnston, Dayton; John P. McSweeney, Cleveland; Herbert D. Couture, Charlotte; Robert Muha and Tom J. Chakos, Chicago; Francis J. Deinzer, Buffalo; Bruce M. Harman, Baltimore; and Robert H. Schaffer, Detroit.

Additional representatives are: Clarence L. Ledin, Boston; James B. Harper, Clifford R. Hawker, Ralph Parker and Walter Harasym, Toronto; Delos P. Young, Portland, Ore.; Eldred E. Jones, Wichita; Gordon D. Fourman, Knoxville; Richard T. Flanagan and Edward J. Herold, New York; James W. Lovill, Cincinnati; Earl J. Finear, Dallas; Raymond J. Miotke, Milwaukee, and Alvin E. Smith, Seattle.

▶ *WORTHINGTON CORP.*—J. A. Walsh & Co., distributor for packaged air conditioning equipment in the Houston area; Clarence S. Wentworth, central region sales manager, replacing William A. Meiter, who has been promoted to general sales manager.

▶ *CHILDERS MFG. CO.*—Power Plant Efficiency Co., representatives for aluminum weatherproof jacketing for lines, towers, vessels and tanks. The company is located in Indianapolis and will service central Indiana.

▶ *AIRTEMP DIV., CHRYSLER CORP.*—Lincoln Sales Corp., Baltimore, distributing commercial and residential air conditioning equipment in Maryland and parts of West Virginia.

▶ *CARRIER CORP.*—Bruce C. Smith, Kansas City branch manager.

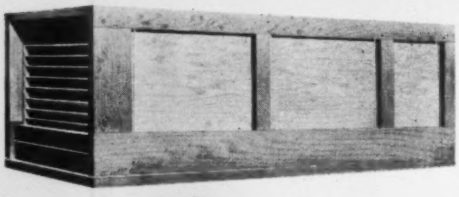
▶ *DEMING CO.*—R. T. Clunan, district representative in the Middle Atlantic states.

▶ *CENTURY ENGINEERING CORP.*—Robert J. Callahan, district sales manager in the Cleveland-Pittsburgh area. Mr. Callahan's territory will include eastern Ohio, western Pennsylvania and part of West Virginia.

AIR CONDITIONED

Where IS THE COOLING TOWER?

Because it's a **COATS HIDEWAY,** the cooling tower could be hidden behind the hedge, in the basement, or even beneath the bedroom. The compact, all redwood **HIDEWAY** is designed for "hideability," and engineered for quiet, almost noiseless, operation

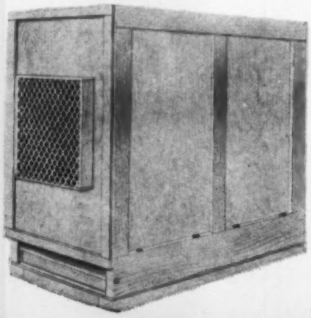


FORCED DRAFT (A Series)
for residential and commercial air-conditioning

- **Compact design makes it easy to hide**
- **Squirrel-cage blower assures quiet operation**
- **Metal in humid air stream is eliminated**
- **All clear-heart redwood construction**

INDUCED DRAFT (ID Series)
for speculative building

- **Designed to utilize minimum floor space**
- **Propeller-type blades are pitched to reduce noise**
- **All clear-heart redwood construciton**



COATS HIDEWAY

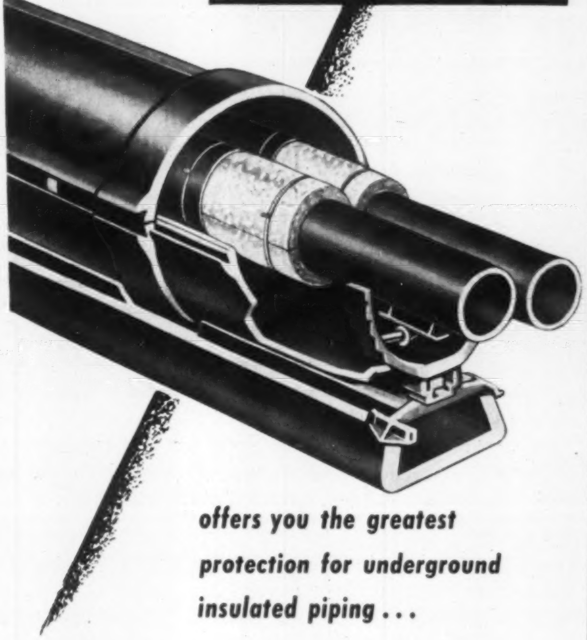
Toungate & Coats

Wholesale air conditioning distributors are invited to write for further information

P. O. Box 241-H • AUSTIN, TEXAS

Two Reasons Why

Universal Vitrified Tile Conduit



offers you the greatest protection for underground insulated piping . . .

1. Made of hard surface salt-glazed vitrified clay — impervious to disintegrating action of electrolysis, water, acids, alkalies, rust, etc.

2. The special Universal feature — interlocking construction and continuous Key-Lock side joints — assure a completed assembly of all parts into a rigid, serviceable and water-tight whole.

Easy to Install • *Two Styles* • *Write for Catalog #54*

Now sold exclusively by:
MUNDET Cork Corporation Distributors

UNIVERSAL SEWER PIPE CORPORATION
Steam Conduit Division
1500 UNION COMMERCE BLDG. • CLEVELAND 14, OHIO

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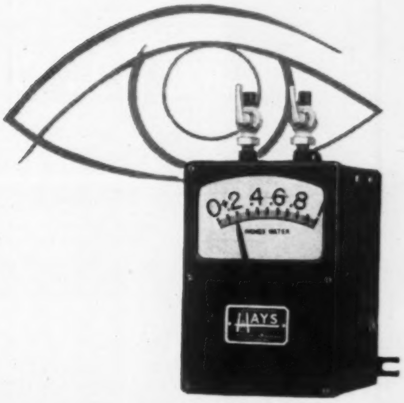
get the inside story

on your **AIR FILTERS**

at a glance!



HAYS AIR FILTER GAGES

With an air filter gage you measure the resistance that air meets in passing through a filter—you get the *inside story* at a glance.

A dirt-clogged filter in air circulating or air conditioning systems lowers efficiency and costs you money. Needless changing of filters to avoid clogging is expensive. A small investment in a Hays air filter gage removes this guesswork . . . results in real savings.

Models and mountings available for every air filter use—features include:

- ***easy to read*—the large dial is visible from a distance.**
- ***minimum maintenance*—there is no oil to evaporate and no leveling is required.**
- ***constant accuracy* — Hays' special "slack diaphragm" retains accuracy.**
- ***easy zero check*—external zero adjusting screw provided.**

Gages can be furnished with contacts for flash or sound alarms or with damper controls. Portable models also available.

For complete details on Hays Air Filter Gages, write for Bulletin 54-751-12.

THE hays CORPORATION

Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Veriflow Meters and Veritrol
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
Electronic Flowmeters
Electronic Feed Water Controls
Miniature Remote Indicators

Michigan City 14, Indiana

WHEN YOU PLAN...

TO SAVE COSTS
Factory-trained Cyclotherm engineers will . . . without charge . . . work from drafting board to installation to estimate your steam demands.

TO SAVE TIME
Factory-trained Cyclotherm servicemen are as close as your telephone . . . They are on call at any hour of the day, night or week-ends.

TO SAVE SPACE
Cyclotherm Steam Generators range from 18 to 500 hp. . . . from 15 to 200 psi. For industrial and commercial plants, shipping, institutions.

Planning a new building? Remodeling an existing structure? As much as 1/3 smaller than other packaged units, the Cyclotherm Steam Generator allows more space for storage and production. Needs only a minimum-sized, minimum-cost boiler room. Or can be placed in a working area. Radiant heat loss is at a minimum.

Lighter-weight, it costs less to transport. Simpler in design, it requires less rigging time . . . rigging costs.

Yet it delivers a guaranteed 80% efficiency . . . pays for itself in a few years in fuel savings alone . . . cuts maintenance costs up to 50%. And it gives you 66% more steam generating power per sq. ft.! Needs less heating area per boiler h.p.!

Exclusive, patented Cyclonic Combustion combined with simplicity of boiler design produces maximum heat transfer wringing every degree of heat from each fuel molecule . . . wasting none. Does in 2 passes what other combustion methods accomplish in 4. Cyclotherm's even rate of heat transfer eliminates localized, heat-retarding scale and "hot spots." All these features assure you of maximum performance.

FREE Discover how Cyclotherm can give you more steam for your dollar. RETURN THIS COUPON TODAY.

YEARS AHEAD IN STEAM GENERATION
CYCLOTHERM®
Steam & Hot Water Generators

Cyclotherm Division
U. S. Radiator Corp.
Oswego, New York

Cyclotherm Division, U.S. Radiator Corp.
Dept. 426 Oswego, N. Y.
Gentlemen: I am interested in reducing steam costs and space.
☐ Please send a Cyclotherm engineer to help estimate my steam requirements.
☐ Please send me your illustrated folder on Cyclotherm Steam Generators.
NAME________________
COMPANY________________
ADDRESS________________
CITY________ZONE____STATE____

WE HEAR THAT . . .

▶ A basis for merging *THE NATIONAL RADIATOR CO.* and *UNITED STATES RADIATOR CORP.* has been approved by directors of both companies. An announcement made recently by the presidents of the firms indicated that stockholders of their companies will be asked to approve the merger at special meetings to be called in the near future.

▶ *AIR FACTORS, INC.*, manufacturer of air distribution and air control products, has announced the completion of an additional 12,000 sq ft of factory space adjoining its plant in Monrovia, Calif.

▶ A new insignia has been adopted by members of the *AIR FILTER INSTITUTE* for use by members in their individual advertising and direct mail programs, *W. B. WATTERSON*, institute president, has announced.

▶ The assets and business of the *GLOBE STEEL TUBES CO.*, Milwaukee, have been purchased by *THE BABCOCK & WILCOX CO.*, according to a recent announcement by both companies. The selling price was approximately $9,300,000. Babcock & Wilcox will continue to operate the plant as part of its Tubular Products Div.

▶ Construction work is nearing completion on an expansion of *THE BRISTOL CO.* Waterbury, Conn. plant. The company's application engineering department has just moved into a new office building addition recently completed.

▶ *BRUNER CORP.* has combined industrial and domestic production of water softeners and filtering equipment under one roof in its new Milwaukee plant. The addition of this 10,000 sq ft of space was brought about to keep pace with the company's rapid growth, according to *T. W. BRUNER*, president of the corporation.

▶ *TEMPERATURE EQUIPMENT CORP.*, Chicago area distributor for *CARRIER CORP.*, was one of 65 winners in the 1954 Direct Mail Advertising Association, Inc. "Best of Industry" competition. It was the second award of this kind received by Temperature Equipment in as many years.

▶ Seventeen engineers of *AIRTEMP DIV., CHRYSLER CORP.* met in Dayton recently to participate in a special factory sponsored air conditioning seminar. The purpose of the conference was to review technical developments in the field of air conditioning, new products and future programs.

PHOENIX
DROP-FORGED FLANGES

. . . and Water Heater Adapters

Precision made . . . well-machined . . .
individually inspected . . .
meet underwriters' specifications.

SEND FOR FREE TANK FLANGE CATALOG

FLANGE DIVISION
PHOENIX MANUFACTURING CO.
CATASAUQUA, PA. • JOLIET, ILL.

classified advertising

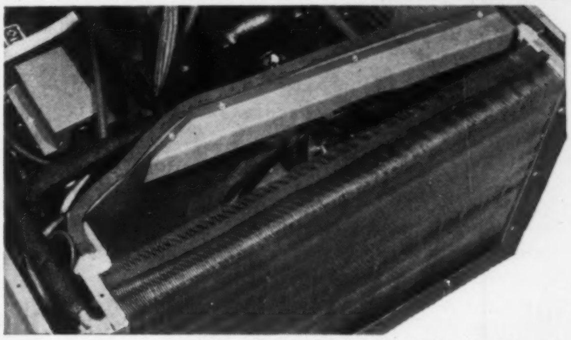
Is the quick, economical way to find what you're looking for. Check the classified page each and every issue for real bargains and hard to find items. It's a quick and sensible means too, of disposing of tools, equipment, and anything else for which you no longer have use. Check the classified page for rates.

√ *Check your needs . . .*

- ☐ ***Personnel***
- ☐ ***Equipment Sales***
- ☐ ***Equipment Needs***
- ☐ ***Manufacturers Agents***
- ☐ ***Lines, etc.***

Whatever your needs in any of the above classifications . . . you can solve them quickly with a classified advertisement. The space rates are reasonable and results are quick. Closing date — the tenth of the month preceding issue.

Better Yet, USE FAIRMONT aluminum



York Air Conditioner A75MR using finned coil surfaces of Fairmont Aluminum.

In room and window air conditioners, and in all better parts and accessories for heating and cooling applications, Fairmont 1100, 3003 and 5052 wrought aluminum sheet is nationally recognized for highest quality and uniformity. Improved appearance, high thermal conductivity, light weight, wear-resistant ductility, and non-corrosive and stainproof surfaces—all these objectives and more are readily achieved.

Fairmont bright aluminum rolling mill products—sheet, coil and circles, are now available for prompt delivery to meet manufacturing schedules.

FALCO

SALES OFFICES:
Baltimore, Buffalo, Chicago, Cleveland, Denver, Fairmont, Indianapolis, Los Angeles, New York City, Philadelphia, St. Louis, Schenectady, Seattle

FAIRMONT
ALUMINUM COMPANY
•
Fairmont, West Virginia

WE HEAR THAT

Continued

▶ *THE AMERICAN WELDING SOCIETY* has formed a technical council to plan, review and coordinate the society's varied technical activities. *I. MORRISON*, of *MORRISON STEEL PRODUCTS, INC.*, is serving as chairman.

▶ *NEW YORK UNIVERSITY's* Division of General Education will offer adult evening courses in heating and ventilating, air conditioning, heating and air conditioning design, and elements of refrigeration during the spring 1955 term.

▶ *HERBERT H. REICH* has announced the opening of his new firm, *H. H. REICH CONSULTING ENGINEERS*, located in Pittsburgh. Mr. Reich's new company will specialize in the design, estimating and detailing of heating and air conditioning systems, as well as industrial and power piping.

▶ *STANDARD ROLLING MILLS, INC.* has been purchased by *REVERE COPPER AND BRASS, INC.* To be known as the *STANDARD ROLLING MILLS DIV.*, it is expected to add an initial $7,500,000 to Revere's annual sales.

▶ A complete sales and service reorganization has taken place in *THE SWARTWOUT CO.'s* "Autronic" process controls division. Sales to the chemical process and refining industries will be separated from the company's other divisions. Sales to central stations will continue to be handled by the power plant equipment sales force. A regional product manager is being appointed to head each of eight new sales territories.

▶ *JENN-AIR PRODUCTS CO.* has announced plans for a new 25,000 sq ft plant to be erected in Indianapolis. *LOUIS J. JENN*, company president, states that the expansion was imperative due to the growing demand for the company's products.

▶ Production of "Unibestos" pipe insulation started recently at the new Tyler, Texas plant of the *UNION ASBESTOS & RUBBER CO.*

▶ A new mill depot has been opened by *WOLVERINE TUBE, DIV. OF CALUMET & HECLA, INC.* to serve the Miami area. The depot will stock the company's seamless copper water tube, automotive tube and refrigeration tube.

▶ Eighty-five of *THE TRANE CO.'s* field sales engineers recently attended the company's second annual engineering seminar. During the three day conference, nearly 30 technical and semitechnical talks were given.

Where the problem is ventilation — the solution is a WESTERN SYSTEM

AT NORTHROP AIRCRAFT INC.

Problem: The Anaheim, Calif. Division of Northrop Aircraft, Inc. manufactures optical range finders and other ground weapon fire control devices for U.S. Army Ordnance. Dust-free ventilation a must! Solution: 38-30" Western Rotaries with Western-aire Curb-Mounted fans exhaust 18 million cubic feet of air per hour from the 250,000 sq. ft. building.

AT YOUR PLANT

Western Rotary ventilators, with or without fans, can do the most for you. A 2 mph wind operates the Western Rotary—and it continues to exhaust during wind lulls due to superior balance design. Years of trouble-free performance—bearings carry lifetime guarantee. Check Sweet's or AEC for high exhaust capacity figures. Then specify Western—a first-rate line of rotary, stationary, continuous ridge, directional ventilators and exhaust fans. Handled by wholesalers coast to coast.

Western Engineering & Mfg. Co.

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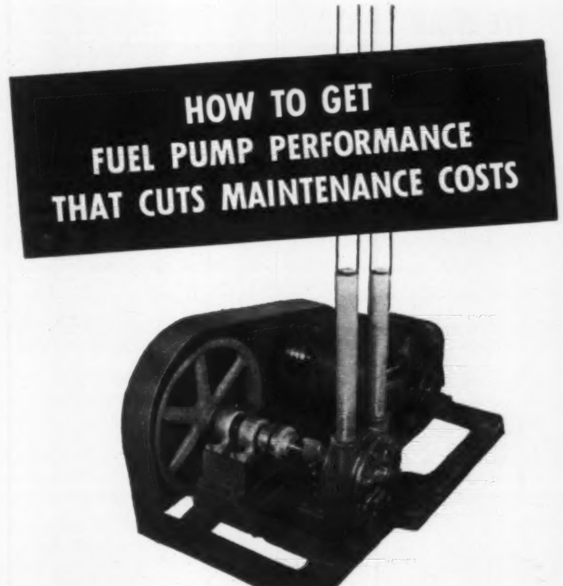
Dealers—order from your local jobber.

Write for catalog, or tell us your special installation problems.



HOW TO GET FUEL PUMP PERFORMANCE THAT CUTS MAINTENANCE COSTS

Install TUTHILL TYPE SU *Pumping Units For Dependable Service in Industrial Heating*

Tuthill Type SU multiple V-belt pumping units provide structural and performance advantages for dependable, uninterrupted operation that add up to reduced maintenance expense.

Features like these make the SU outstanding for handling heavy fuel oils in industrial heating:

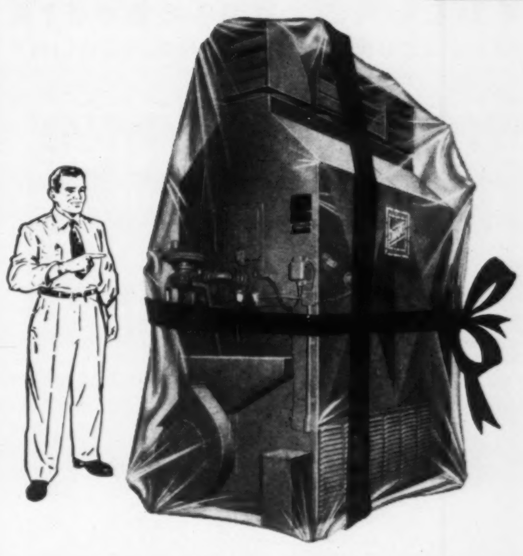
- ★ **Motors up to 5 h.p. mounted on slotted slide rails for easy adjustment or replacement. No drilling or tapping required.**
- ★ **Cast iron base with mounting bolts and adjustments easily accessible.**
- ★ **One-point belt-tension adjustment.**
- ★ **Jack shaft, supported by ball-bearing pillow blocks, carries entire weight of pulley and absorbs belt tension.**
- ★ **Pump, jack shaft and pillow blocks available as separate unit.**
- ★ **Pump and jack shaft direct-connected by flexible coupling for better alignment and simplified mounting.**
- ★ **Wide range of pump models and capacities.**

Complete data is presented in Tuthill Catalog No. 107. Write for your copy today.

TUTHILL
PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY
Dependable Pumps since 1927
939 East 95th St., Chicago 19, Illinois
Canadian Affiliate: Ingersoll Machine & Tool Co., Ltd.
Ingersoll, Ontario, Canada

another DRAVO HEATER plus!



A complete package . . . ready to install!

Dravo Heaters are a complete package in every respect. No complicated assembly is necessary . . . no extra parts to purchase. To install, simply place the heater where you want it, connect the fuel—power—vent stack and your Dravo Heater is ready to operate!

The complete Dravo Heater package includes pressure regulators, burner, burner controls, forced draft and air supply fans, motor, thermostat, oil strainer, discharge nozzles, a heavy duty two-stage oil pump and all safety devices including electronic flame control.

A lot of these items are listed as "extras" on comparable type heaters, but on Dravo Heaters, they're standard equipment—part of Dravo's complete "packaged" heater.

Couple this feature with the many others offered by Dravo Heaters and you see why dollar for dollar, year for year, your best heating investment is Dravo Heaters.

MAIL THE COUPON

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

DRAVO

Please send me complete information about the Dravo:

☐ *Counterflo* **Space Heater** ☐ *Paraflo* **Space Heater**
☐ **Gas *Fired* Unit Heater**

☐ Please have a representative call at no obligation to me.
Ask for Bulletin HI 598-7980.

Name ______________________ Title ______________
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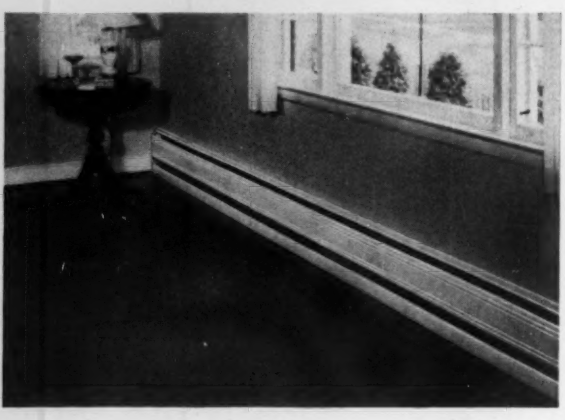
The Big Hit of the Show!
1955 International Heating & Ventilating Show

VULCAN Baseboard
YEAR-ROUND • HEATING-COOLING

"Home Conditioning"
(Integrated with famous VULCAN TRIMLINE)



. . . a new concept in year-round "home conditioning"

Never has there been anything like it — the first integrated year-round baseboard heating-cooling system for the American home.

Advanced engineering that retains 100% of its heating performance and still furnishes a comparable amount of cooling comfort.

In Winter — smooth, balanced distribution of heat from Vulcan's famous TRIMLINE baseboard radiation.

In Summer — controlled flow of "cooled" air from entire length of the same baseboard.

Tested, Proved — exhaustive research plus hundreds of testing hours, both in the laboratory and in the field, have proved the value of Vulcan Baseboard "Home Conditioning."

. . . originators of fin-tube baseboard radiation; and manufacturers of TRIMLINE for residential baseboard heating at its best.

For Descriptive Literature and Data Write to:

The VULCAN Radiator Company
775 Capitol Avenue
Hartford 6, Connecticut

WE HEAR THAT

Continued

▶ Technical standards set by the *FUEL OIL & WATER HEATER MANUFACTURERS' ASSOCIATION* for construction and manufacturing practices for fuel oil heaters, have resulted in considerably less corrosion and heater failure, Henry S. Lewis, association president, has announced. Insurance carriers have accepted these standards.

Similar standards for instantaneous heaters, converters, and other water heating devices also have public acceptance, and technical research groups are in the process of establishing capacity and installation standards for all classes of water and heat exchange equipment being manufactured by association members, Mr. Lewis continued.

▶ In a move to consolidate operations following completion of defense contract commitments, *AFFILIATED GAS EQUIPMENT, INC.*, has sold its Cleveland *BRYANT HEATER DIV.* plant to the *EATON MFG. CO.* of Cleveland.

▶ *S. W. BROWN*, former chief engineer for the marine department of *CARRIER CORP.*, has opened his own business as a consulting engineer in New York City. The firm will specialize in the design and application of air conditioning and refrigeration systems.

▶ *GENERAL PRECISION EQUIPMENT CORP.* and the holders of about 80 percent of the outstanding preferred and common stock of *GRISCOM-RUSSELL CO.*, Massillon, Ohio, have agreed upon terms for an exchange of stock which, if consummated, will result in the acquisition of control of Griscom-Russell by General Precision Equipment.

▶ All departments of the *ILG ELECTRIC VENTILATING CO.* have undergone a complete modernization, a program that was begun four years ago.

▶ *JOHNSON SERVICE CO.'s* central district headquarters is now located in Evanston, Illinois. *K. A. WRIGHT*, Johnson vice president, is manager of the district, which is one of three major administrative divisions of the company's field organization.

▶ Drop shipments of "Freon" fluorinated hydrocarbon refrigerants in any quantity for use in replacement or service work have been discontinued, *E. I. DU PONT DE NEMOURS & CO.'s* "Kinetic" Chemicals Div. has announced. This means that stocks of these refrigerants will be maintained by recognized wholesalers, with no direct shipments from Du Pont warehouses.

▶ *FIELDEN INSTRUMENT DIV. of ROBERTSHAW-FULTON CONTROLS CO.* has expanded its plant and office facilities in Philadelphia to three times

3 Outstanding Advantages of YEOMANS

Pneumatic Ejectors

1—pass any solids up to the size of the inlet and discharge valves.

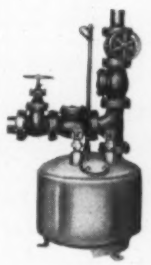
2—completely enclosed—hermetically sealed—completely sanitary.

3—maintenance cost negligible. Frequent check-ups unnecessary.

The SHONE® Pneumatic Ejector is recommended for capacities up to 1,000 g.p.m. and heads to 50 ft. It is a simple, sturdy, mechanically-controlled unit consisting of a closed receiver or pot with check valves on the inlet and discharge; a pilot slide valve actuated by two open cast iron bells suspended in the receiver; and a piston valve controlled by the pilot slide valve which opens and closes the pressure and exhaust connections. The closing of the exhaust connection admits compressed air to the receiver and forces the contents out through the discharge check valve and discharge charge pipe.

Action is positive; there are no internal parts to restrict flow; the sturdy, simple parts are few and do not move fast or far; there is practically no wear, and the pump is always ready for quiet, efficient service.

The EXPELSOR® Pneumatic Ejector for small volume removal of solids-carry liquids in capacities up to 100 g.p.m. and larger, heads to 35 ft. Suitable for building and industrial plant waste, and medium-to-small sewage systems. Performance and operation are similar to the SHONE, but the EXPELSOR has two rigid metal electrodes of unequal length suspended in the receiver. The rising liquid closes the circuit between them and energizes a relay which starts an air compressor. Compressor shuts off when liquid drops below the longest electrode. May also be operated by steam pressure. Absolutely reliable, positive, trouble-free; requires no maintenance or attention.



More than 50 years of Pump Experience and a complete line of pneumatic ejector type pumps enable Yeomans to give you the recommendations and service which will serve you best. Unequalled experience in ejector installation and maintenance are the basis for these recommendations, and since Yeomans also produce a complete line of centrifugal pumps, these recommendations are completely unbiased.

Contact your Local Yeomans representative listed in the Yellow Pages of your telephone book under "Pumps" or write direct to factory for Bulletin 4005 SHONE Ejectors; Bulletin 4405, the EXPELSOR.

YEOMANS BROTHERS COMPANY

2000-5 No. Ruby Street **Melrose Park, Ill.**

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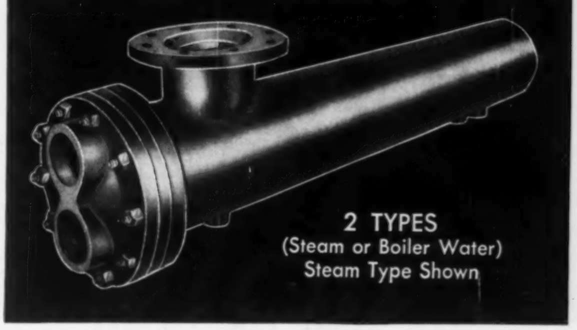
SPECIFIED

for a growing variety of applications

GENERAL

HOT WATER CONVERTERS



2 TYPES
(Steam or Boiler Water)
Steam Type Shown

You will find successful applications of GENERAL Converters in surprisingly different hot water heating systems . . . from factory offices to greenhouses . . . schools to swimming pools. It figures! These modern converters are specifically designed for high-efficiency transfer of heat from steam or boiler water to serve separate heating systems. And whether the job is heating an apartment building or melting snow, they do it effectively . . . economically.

GENERAL Converters are made with welded steel shell, copper tubing and non-porous cast iron heads. Gasket surfaces are machined . . . tubing is *electronically* expanded into tube sheets. And every unit is tested 300# air-under-water, both shell and tubes. The pay-off is long, troublefree performance. Send for illustrated, 12-page catalog showing detailed operating and installation data. Just clip and mail coupon below.

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TANKLESS AND INDIRECT WATER HEATERS AND HEATING SPECIALTIES

General Fittings Company
Dept. A, 123 Georgia Ave., Providence 5, R. I.
Please send me Catalog 54C

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Address...
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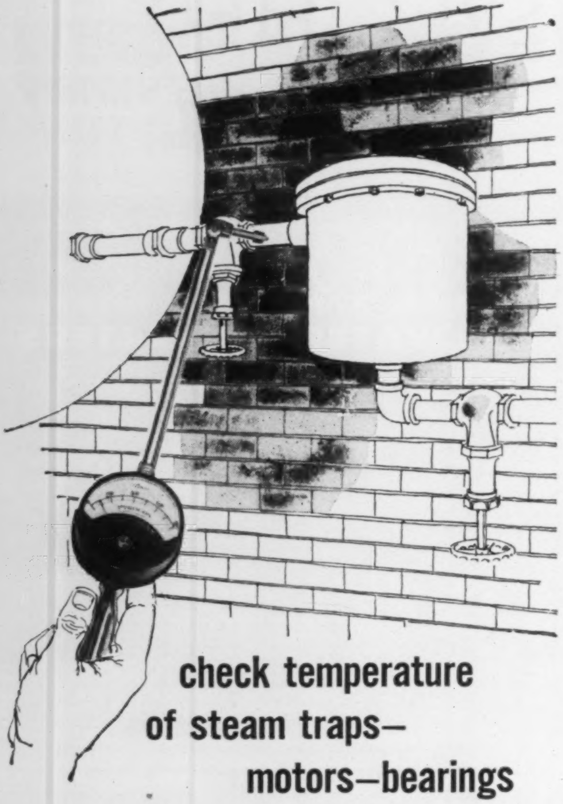


check temperature of steam traps— motors—bearings

. . . quickly and accurately with the Alnor Pyrocon, the portable contact pyrometer for taking surface temperatures. This handy, portable instrument can be your most useful maintenance and installation tool . . . it provides accurate temperature readings instantly of any surface (metallic or non-metallic), flat, curved, stationary or revolving.

It's a well-balanced instrument mounted in a sturdy case for protection against the usual hazards of on-the-job service. Jeweled movement is also heavy-duty, shock-resistant type that will withstand hard and continuous use . . . performing with laboratory accuracy.

A wide selection of thermocouples and extension arms assures its adaptation to your needs. Eight standard F. scale ranges are available up to 1200°F. Send for complete details contained in Bulletin 4257. Illinois Testing Laboratories, Inc., Rm. 513, 420 N. LaSalle St., Chicago 10, Ill.

Alnor

PRECISION INSTRUMENTS
FOR EVERY INDUSTRY

WE HEAR THAT

Continued

its former area. A new sales office, operating directly out of the division's plant, will distribute all of Fielden's products in Philadelphia and eastern Pennsylvania. The division has also announced a new engineering and technical service office in St. Louis to serve the Central states.

▶ *ZIDELL MACHINERY & SUPPLY CO.* has announced that it will join with *CLYDE TUBE FORGINGS, LTD.*, of Glasgow, Scotland in establishing a new factory in Portland, Oregon to make welded fittings.

▶ *THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS* has awarded second prize in the Industrial Division to *W. J. GREENE*, assistant director of metallurgical research, and *DR. A. MULLER*, director of metallurgical research, both of *AIR REDUCTION CO.*, for their paper, *Atomic Film Cathode In Inert Gas Shielded Metal Arcs.*

▶ Newly formed *FRASER ASSOCIATES*, manufacturer's representative for industrial, commercial and residential heating equipment, is located at Beloit, Wisconsin and will serve the trading areas of Beloit, Janesville and Madison, Wisconsin and Rockford and Freeport, Illinois, *GEORGE M. FRASER*, president, has announced.

▶ A new research section dealing with problems inherent in the design of atomic power plants has been established at *THE FRANKLIN INSTITUTE* Laboratories for Research and Development. Called the Heat and Power Section, the department has *FRANCIS L. JACKSON* as its head.

▶ Four *MUELLER CLIMATROL* salesmen were presented the 1954 company president's diamond pin awards. Receivers of the award and their territories are *JOHN L. STEWART*, northern California; *MEL JAMES*, Iowa; *DICK SCHMIDT*, southern Wisconsin; and *M. H. THOMAS*, Ohio.

▶ *FIRESTONE TIRE & RUBBER CO.* will handle *MITCHELL MFG. CO.* room air conditioners exclusively in its retail stores. Firestone, which for the past three years has sold air conditioners under its own label as well as other brands, will discontinue its own model and drop other lines.

▶ In Chicago recently, *JOHNSON SERVICE CO.* sponsored a two day showing of developments in automatic temperature, humidity and air conditioning control. Over 1200 engineers, contractors and school and hospital officials attended.

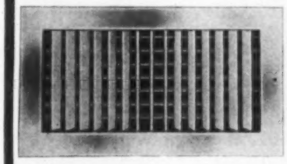
"GENERAL"

the name that stands for . . . QUALITY in air conditioning

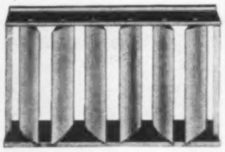
REGISTERS and GRILLES

Already acclaimed one of the leaders in the commercial grille field, the consistent quality of General products is bringing the name "preferred acceptance" across the country—with those who know.

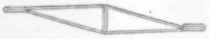
G-R precision workmanship—and mass output—are the result of the finest in high-production facilities. Investigate the line that's—"Second to None."



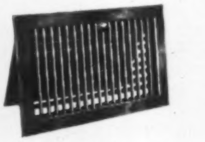
EVERYTHING STREAMLINED
General adjustable registers and grilles are streamlined throughout for appearance and operating efficiency, including fins, damper blades, and radius edges of the solid frame.



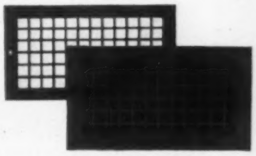
***Silentite* DAMPER**
Standard on General registers or furnished separately, the ***Silentite*** opposed-blade damper controls volume without turbulence. Reinforced hollow blades of great strength allows positive gripping of bearings for easy action without rattling.



Cross section shows streamlined contour.

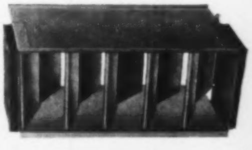


"RANCH HOME"
Adjustable residential winter-summer heating-cooling model.



STAMPED GRILLES
Plain Lattice, Pencil-proof (schools), Sanitary (hospitals).

DUCTROL
Line includes air directors, mounting frames, fusible links, door grilles, various accessories, metals and finishes.



A Complete Line
For Cooling and Ventilating

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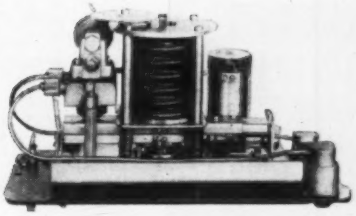


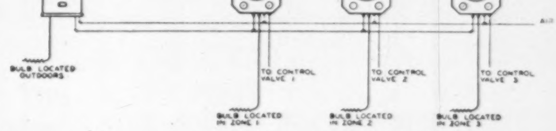
HIGHLY ACCURATE REMOTE CONTROL

with Taylor TRANSAIRE Temperature Transmitter*

THIS compact, super-responsive temperature transmitter is particularly adaptable where zones are remotely located from a centralized control room. The point of measurement can be 1000 ft. or more away from the control panel—there are no long thermal systems involved.

Short, shiftable range spans give a remarkable degree of accuracy—½% of the range span on critical applications. A 50° range span can be continuously adjusted within range limits of 0 to 150°F., covering cold, normal and hot applications all in one instrument. 100, 200 and 400 degree range spans are also available.

Drawing shows how a number of Pneumatic Set Zone Controllers can be automatically adjusted by one TRANSAIRE Temperature Transmitter.



Ask your Taylor Field Engineer, or write for **Catalog 5.** Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

*Reg. U.S. Pat. Off.

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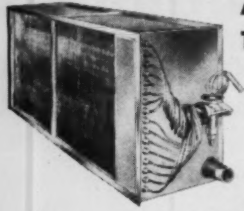
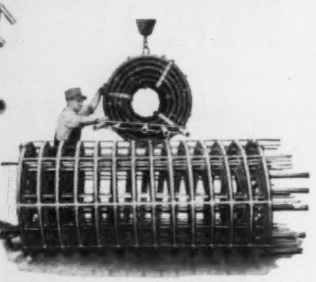
MEAN ACCURACY FIRST

Rempe
FIN AND PIPE COILS
of
STAINLESS STEEL

For Handling All Types of Corrosive Air Mixtures or Liquids, To Be Heated or Cooled.





We have complete facilities and tested technique for the fabrication, welding and finishing of pipe and fin coils made from all types of stainless steel. Send details or blueprints for engineering advice and quotations on your requirements, for all types, all materials of pipe and fin coils. Send for your free copy of the Rempe Engineering Data Book on pipe and fin coils, prepared especially for the design engineer.

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REMPE CO.
Founded 1890

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Install BUILDERS SHUNTFLO STEAM METERS right in your steam lines. Keep track of steam costs by seeing where steam is going and how much. Shuntflo Meters available in Model SMKS (shown) for 2″ to 14″ lines — Model SMDH for 1″ and 1½″ lines. **Write for Shuntflo Bulletins. Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 381 Harris Ave., Providence 1, R. I.**

BUILDERS-PROVIDENCE
DIVISION OF B-I-F INDUSTRIES, INC.
METERS FEEDERS CONTROLS

MEETINGS & CONVENTIONS

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC., Conference of Canadian Chapters—February 14-15, Coliseum, Toronto. The conference is being held concurrently with the Canadian National Heating and Air Conditioning Show. General chairman: Jack Jenkinson, 1025 Weston Rd., Toronto 9.

INDUSTRIAL VENTILATION CONFERENCE—February 14-17, Kellogg Center, Michigan State College, East Lansing, Mich.

NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION, Short courses on the latest trends in the warm air heating industry.—February 14-17, Oklahoma A & M College; March 9-12, Purdue University; March 28-31, Michigan State College; April 6-8, Penn State College; April 18-21, Iowa State College. Chairman: Bruce McLouth, NWAHACA, 145 Public Sq., Cleveland 14.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, Founding Anniversary Meeting—February 16, New York. Organization Anniversary Meeting—April 16, Stevens Institute of Technology, Hoboken, N.J. and New York. Diamond Jubilee Spring Meeting—April 18-22, Baltimore. Diamond Jubilee Semi-Annual Meeting—June 19-23, Boston. Diamond Jubilee Annual Meeting—November 13-18, Chicago. Attendance at some sessions will be limited to invitation only. ASME Headquarters, 29 W. 39th St., New York.

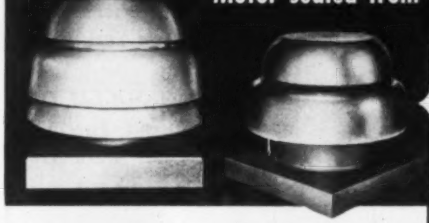
NATIONAL ASSOCIATION OF CORROSION ENGINEERS, Tulsa Section—6th annual Corrosion Short Course for Pipeliners, February 16-18, Mayo Hotel, Tulsa, Okla. Thomas M. Ragland, Phillips Petroleum Co., is chairman of the course.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, Corrosion short course—March 1-4, Carolyn P. Brown Memorial Center, University of Tennessee, Knoxville. Registration: A. B. Campbell, c/o the association, 1061 M & M Bldg., Houston 2.

11TH ANNUAL CONFERENCE AND EXHIBITION OF THE NATIONAL ASSOCIATION OF CORROSION ENGINEERS, Technical committees' reports—March 7-11, Palmer House, Chicago. Registration: A. B. Campbell, c/o the association, 1061 M & M Bldg., Houston 2.

OIL-HEAT INSTITUTE OF AMERICA, 33rd annual convention—Tentatively April 4-7, Edgewater Beach Hotel, Chicago. OHI headquarters, 500 Fifth Ave., New York 36.

COOK VENTILATORS
now with BLOWER or PROPELLER
Easy to install • All aluminum • Low silhouette
Motor sealed from air stream



Each blade is balanced, set and locked in proper pitch by taper-pin bolt.

Blower type, Model BV from 9" to 21". Backwardly inclined impeller, non-overloading.

Propeller type, Model FV from 12" to 24". Thousands of Cook-built propellers are in daily use.

7",9" or 10" Blower Roof Ventilator Model R

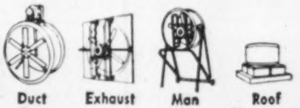
All models direct drive . . . damper optional

Model R with square base

Model R with slope base

Model R with round base

COOK



Write for catalog HP, Loren Cook Co., Berea, Ohio

Monarch
NOZZLES For HUMIDIFYING

Monarch Brass F-80 Air Conditioning Nozzles (or 1/4" male one-piece H-261 style) produce the finest possible breakup of small capacities with low direct pressure only. No air required.

The most popular size is #3.00 which operates on as little as 25 pounds pressure, delivers 1.00 gph and produces a very wide angle of spray (120°) in a fine, soft, fog-like mist.

Available in 25 different capacity sizes from .57 gph upwards, all Brass construction with 120 mesh Monel screen strainers.

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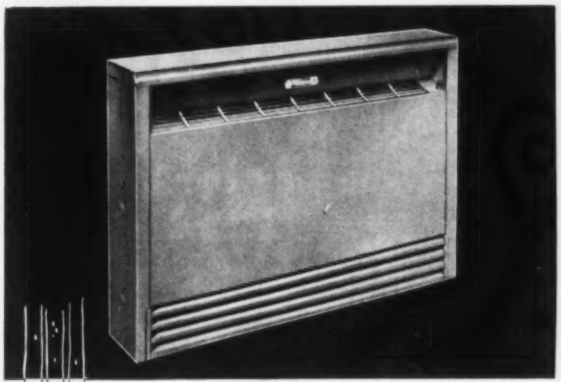
Canadian General Filters Ltd., Toronto 16, Canada



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Superb performance

WHEN top architects and heating engineers want the finest in modern heating, they specify Modine Convector Radiation. Here's an unmatched combination of beauty, long life and uniform, healthful heating. Ask your Modine representative for full information — he's listed in the classified section of your phone book. Or write for Bulletin SA-54, Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

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Modine
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for

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and **BUYING**
INFORMATION

Use your complete, up-to-date

JANUARY DIRECTORY ISSUE

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Convert Stack Losses into BIG Fuel Savings
with a
PREFERRED
DRAFT-A-JUSTOR
100% Statically Balanced. Impossible to Stick or Jam. Easy to Install and Adjust.
1—On top of breeching.
2—On side of breeching.
3—Under breeching.
4—At base of chimney.
Preferred Utilities for Results

In that next boiler installation be sure to include a Preferred Barometric Draft-A-Justor. Controls draft automatically and eliminates efficiency losses due to excess air. Thousands of these controls are saving millions of fuel dollars.

- Saves 10 to 30% in Fuel.
- Insures Perfect Draft Control.
- Cuts Losses from Brickwork Leakage.
- Increases CO_2 Percentage.
- Reduces Fly Ash Quantity up Stack.
- Cools Walls next to Chimney.
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Sizes to meet every job. Approved by Underwriters' Laboratories, Inc. Write for Bulletin 800.

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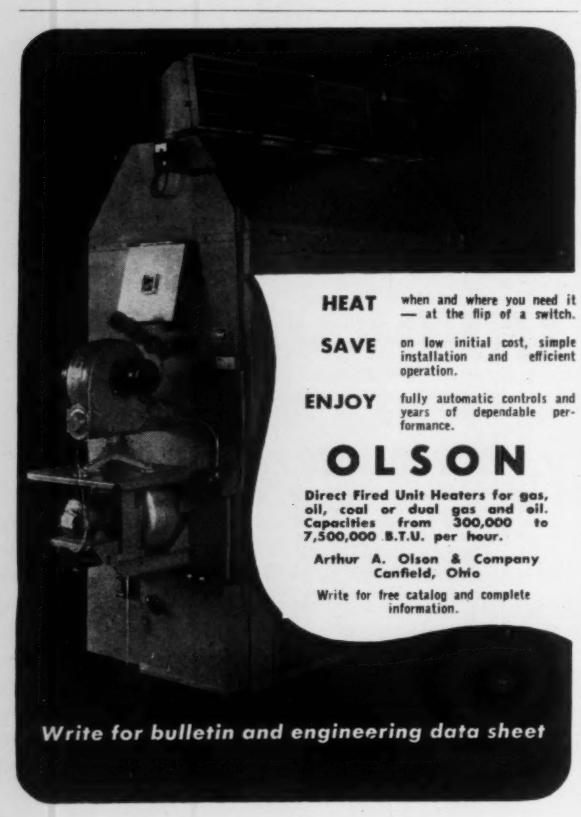

HEAT when and where you need it — at the flip of a switch.

SAVE on low initial cost, simple installation and efficient operation.

ENJOY fully automatic controls and years of dependable performance.

OLSON

Direct Fired Unit Heaters for gas, oil, coal or dual gas and oil. Capacities from 300,000 to 7,500,000 B.T.U. per hour.

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Continued

AMERICAN SOCIETY OF HEATING AND AIR-CONDITIONING ENGINEERS, INC., Regional meeting — April 14-16, Skirvin Hotel, Oklahoma City. ASHAE Headquarters, 62 Worth St., New York 13.

AIR POLLUTION CONTROL ASSOCIATION, 48th annual meeting—May 22-26, Detroit. Executive secretary: Harry C. Ballman, APCA, 4400 Fifth Ave., Pittsburgh 13.

NATIONAL DISTRICT HEATING ASSOCIATION, 46th annual meeting—May 23-26, Edgewater Beach Hotel, Chicago. The association is at 827 Euclid Ave., Pittsburgh 6.

AMERICAN WELDING SOCIETY, 3rd annual show—June 8-10, Municipal Auditorium, Kansas City, Mo. The annual spring technical meeting is to run concurrently with the show, June 7-10. National secretary: Joseph G. Magrath, at the society, 33 W. 39th St., New York 18.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION, 63rd annual meeting—June 20-24, Hetzel Union Bldg., Pennsylvania State College. Registration: Professor K. L. Holderman, 103 Mechanical Engineering Bldg., Pennsylvania State College, State College, Pa.

AMERICAN SOCIETY FOR TESTING MATERIALS—June 26-July 1, Chalfonte-Haddon Hall, Atlantic City, N.J. The society is at 1916 Race St., Philadelphia 3.

WESTERN PLANT MAINTENANCE SHOW—July 12-14, Pan Pacific Auditorium, Los Angeles. Management: Clapp & Poliak, Inc., 341 Madison Ave., New York 17.

INSTRUMENT SOCIETY OF AMERICA, 10th annual conference and exhibit—September 12-16, Shrine Exposition Hall and Shrine Auditorium, Los Angeles, Show office: 3443 S. Hill St., Los Angeles 7.

SECOND INTERNATIONAL AUTOMATION EXPOSITION—November 14-17, Navy Pier, Chicago. Exposition headquarters is at 845 Ridge Ave., Pittsburgh 12.

9TH EXPOSITION OF THE AIR CONDITIONING AND REFRIGERATION INDUSTRY—November 28-December 1, Atlantic City. The exposition is sponsored by the Air Conditioning and Refrigeration Institute, 1346 Connecticut Ave., N.W., Washington.

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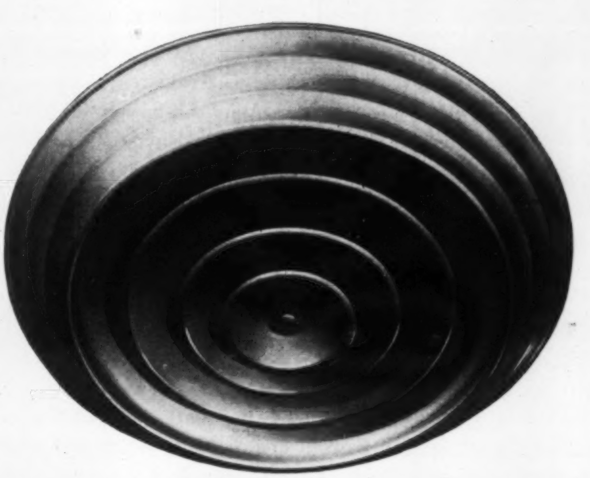

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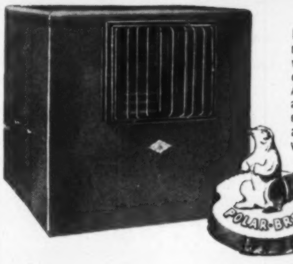

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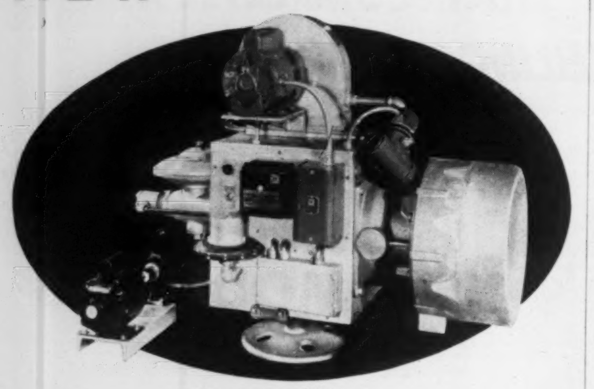

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Studies of Thermal Conductivity of Liquids, Supplement to Part I, A Literature Survey of the Thermal Conductivity of Liquids—By Byron C. Sakiadis and Jesse Coates. Bulletin No. 48, Engineering Experiment Station, Louisiana State University, Baton Rouge. 50c (no stamps).

Mechanical and Electrical Equipment for Buildings—3rd Ed. By Charles Merrick Gay, Charles De Van Fawcett and William J. McGuinness. 564 pp. John Wiley & Sons, Inc., 440 4th Ave., New York 16. $8.50.

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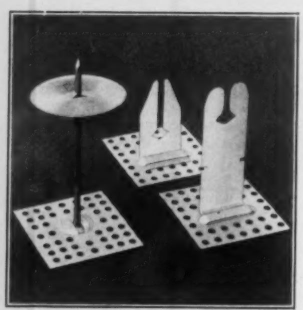

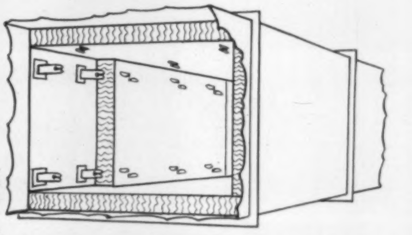

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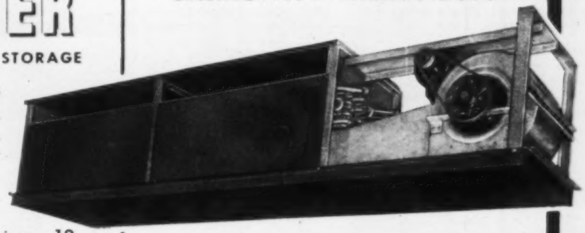

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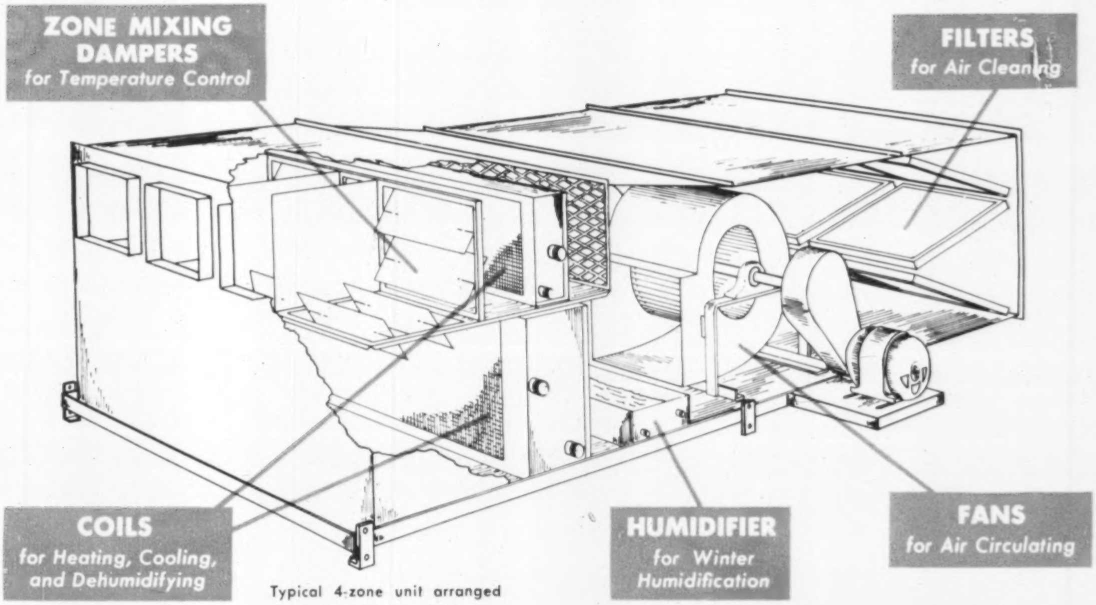
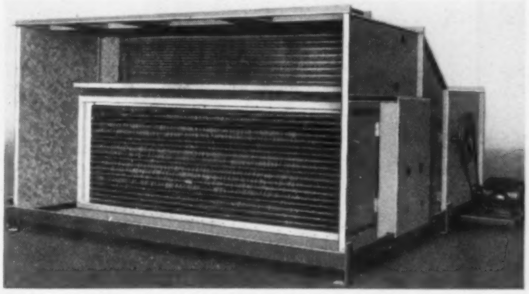
Zink Co., John *
Z-Crete Div., Zonolite Co. 33


ZONE MIXING DAMPERS
for Temperature Control
FILTERS
for Air Cleaning
COILS
for Heating, Cooling, and Dehumidifying
HUMIDIFIER
for Winter Humidification
FANS
for Air Circulating

Typical 4-zone unit arranged for complete conditioning.

Different needs simultaneously in different areas . . . yet handled by this one unit

ZONE CONTROL AIR CONDITIONING



Front panel and mixing dampers removed to show arrangement of heating and cooling coils.

. . . pioneered and perfected by CLARAGE

Clarage Blow-Thru Multitherms are units that take variables in stride! A separate set of mixing dampers for each zone permits proper "balancing" of conditioned air according to the loads imposed by sun effect, wind, occupancy, and other factors.

Thus, in a building of medium size, a single unit provides uniform air conditioning results with far greater economy and simplicity than possible with previous arrangements of equipment. Certainly the Blow-Thru Multitherm is a unit to investigate thoroughly for any application where simultaneously unequal loads are encountered.

A request for Bulletin 1310-A will place in your hands capacities, dimensions, and other descriptive details of Clarage Blow-Thru Multitherms. **CLARAGE FAN COMPANY**, Kalamazoo, Michigan.

You can Rely on CLARAGE

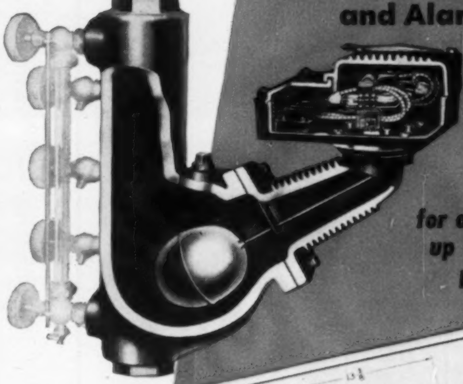
. . . dependable equipment for making air your servant

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES ● IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

See how a good idea grows and grows

McDONNELL No. 157

Pump Control, Low Water Cut-off and Alarm



for all boilers up to 150 lbs. pressure

Right from the start most heating men recognized that the McDonnell No. 157 was bound to be a success. It offered the favorite of all higher pressure pump controls and cut-offs in a self-contained water column body. It combined proven performance with a new speed and economy of installation.

What you may not realize is how much we have been forced to widen this basic idea. Today there are at least 9 variations of that first No. 157 adapted to offer longer or shorter water columns; different operating levels; different tappings for gauge glass, try cocks and equalizing lines. All can be furnished with either manual or automatic reset.

The drawings show some of these No. 157 models that engineers, boiler manufacturers and contractors have asked for. Whatever you might need just name it and chances are we can pick it right off the shelf.

All of these No. 157 models are built around the famed McDonnell No. 150 Pump Control, Low Water Cut-off and Alarm. They represent the one right way to control the boiler feed pump — according to the boiler water itself. They are built from the word go to stand the gaff of high temperature and pressure—with completely packless construction, heavy duty mercury switches, all operating parts up out of the hot zone, porcelain bead insulation and many other refinements.

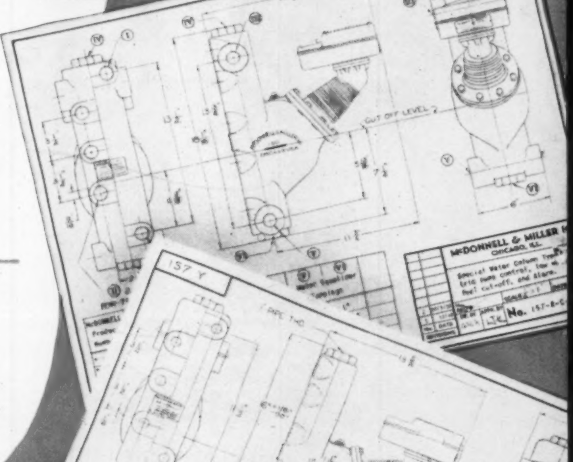
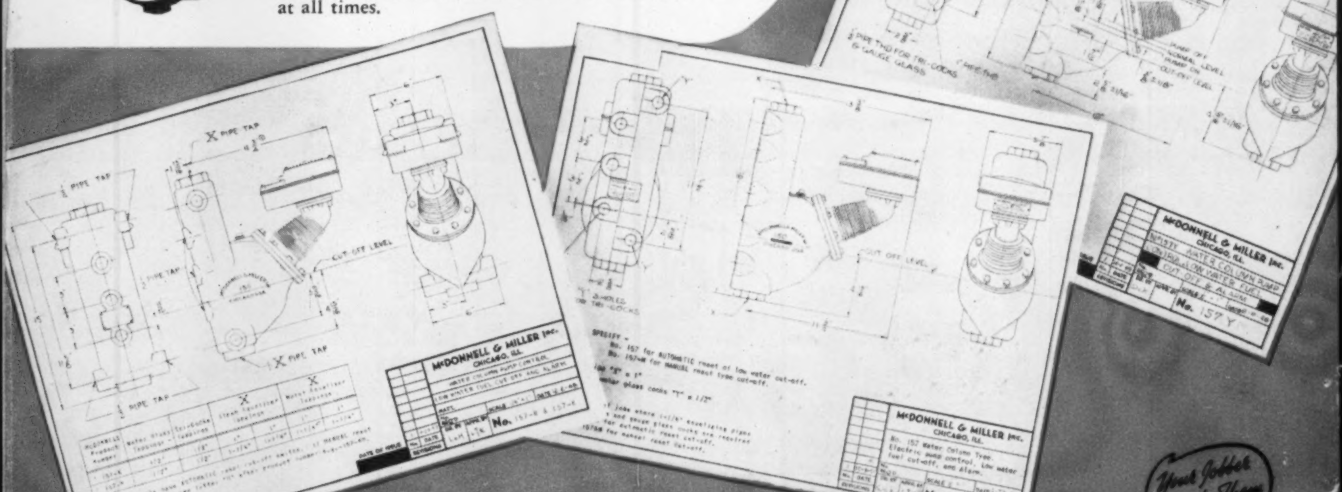
For complete information on the No. 157 models available write for copies of engineering drawings.

McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Used with the No. 157 . . .

McDONNELL No. 27 Make-up Water Feeder

The No. 157 starts and stops pump as boiler water rises and falls — keeps the boiler level where it should be for maximum steaming efficiency. An ideal team-mate is the No. 27 Make-up Feeder, which adds water to receiver as needed to assure an adequate minimum supply at all times.

Doing One Thing Well

Your Jobber Stocks Them

McDONNELL *Boiler Water Level Controls*